

3.12 WILDLIFE

The wildlife section addresses terrestrial mammals, marine mammals, and birds. Each has its own subsection. In addition, threatened and endangered species are addressed in Section 3.14, Threatened and Endangered Species.

SYNOPSIS

This section describes current conditions and evaluates potential impacts to wildlife from the proposed action and alternatives. Each alternative is examined by major project component: mine site; transportation infrastructure; and pipeline.

Terrestrial Mammals

Summary of Existing Conditions:

Species discussed in this section are managed by Alaska Department of Fish & Game (ADF&G) as game animals and as predators of game animals, and are considered important ecologically and highly valued by subsistence communities throughout the EIS Analysis Area as well as by sport hunters. They are also highly valued for non-consumptive wildlife viewing and aesthetics. Large mammals present in the EIS Analysis Area include moose, caribou, brown bear, black bear, Dall sheep, bison, and gray wolf, small mammals include coyotes, red fox, Arctic fox, Canadian lynx, American marten, American mink, least weasel, river otter, wolverine, beaver, muskrat, porcupine, red squirrel, lemmings, shrews, voles and snowshoe hare. There are no terrestrial mammals in the EIS Analysis Area listed as threatened or endangered under the Endangered Species Act (ESA).

Expected Effects:

Alternative 1: No Action – Minor impacts would continue from ongoing mineral exploration, from reclamation of existing exploration, and from related disturbance (camp, roads, and airstrip) which may affect terrestrial animals.

Alternative 2: Donlin Gold's Proposed Action – The overall direct and indirect effects of the mine site construction phase, operations and maintenance phase (operations phase), and closure, reclamation, and monitoring phase (closure phase) under Alternative 2 would be considered moderate, based primarily on long-term but localized (from a regional perspective) habitat loss, high magnitude, long-term disturbance from the noise of blasting, machines and presence of people in the mine area, which would result in barriers to normal movement patterns of animals, and a small potential for wildlife effects from contamination of local water sources with toxic materials.

The overall direct and indirect effects of the transportation facilities under Alternative 2, including construction of port facilities and the mine access road, operation of barges and

material transfer vehicles and aircraft, and closure, would be considered minor based primarily on a low magnitude of habitat loss or modification, chronic but small magnitude disturbance from passing barges and trucks, dust, and the potential for accidental fires affecting habitat. After mine closure, potential impacts along the transportation corridor would be permanent but very low in magnitude and localized.

The overall direct and indirect effects of the natural gas pipeline construction, operations, and closure under Alternative 2 would be considered moderate from a regional perspective, based primarily on high magnitude but short-term disturbance and habitat loss/modification during construction, and permanent, regional improvements to access for hunters and trappers which could lead to medium magnitude increases in mortality for important game species and subsequent changes in game management regulations.

Other Alternatives: The direct and indirect effects of other alternatives on terrestrial mammals would be very similar to the effects of Alternative 2. Differences of note include:

- *Alternative 3A (Reduced Diesel Barging: LNG-Powered Haul Trucks)* – The effects of the transportation facilities under Alternative 3A would be less than the effects of Alternative 2 because of the reduced need for hauling diesel fuel, but would also be considered minor.
- *Alternative 3B (Reduced Diesel Barging: Diesel Pipeline)* – The overall effects of the transportation facilities under Alternative 3B, including construction of port facilities and the mine access road, operation of barges and material transfer vehicles, and closure would be less than the effects of Alternative 2 because the need to haul diesel fuel would be eliminated after the construction period. The overall effects of the diesel pipeline construction, operations, and closure under Alternative 3B would be greater than those described for Alternative 2 because of a longer pipeline route, the more complicated construction phase, and more permanent access roads. The effects on terrestrial mammals would be considered moderate based primarily on high magnitude but short-term disturbance and habitat loss/modification during construction, and permanent, regional improvements to access for hunters and trappers which could lead to medium magnitude increases in mortality for important game species and subsequent changes in game management regulations. The effects of Alternative 3B would also be considered minor.
- *Alternative 4 (Birch Tree Crossing Port)* – The transportation effects of Alternative 4 would be larger than Alternative 2 because of the longer port to mine road, and would also be considered minor.

Marine Mammals

Summary of Existing Conditions:

Seals are the most common marine mammals observed in the Kuskokwim River (RWJ Consulting Inc. 2010). Based on surveys and subsistence harvest information from Quinhagak, Kwethluk, and Akiak, pinnipeds occurring in Kuskokwim Bay and up the Kuskokwim River include harbor and spotted seals, ringed seals, bearded seals, Steller sea lions, and Pacific walrus (ADF&G 2013a, 2013b; Coffing et al. 1999; MacDonald and Winfree 2008; RWJ Consulting 2010). With the exception of harbor and spotted seals, all are either listed or candidates for listing under the ESA and are discussed in Section 3.14, Threatened and Endangered Species. Harbor seals and spotted seals are closely related with range overlap in the southern Bering Sea, including in northern Bristol Bay and Kuskokwim Bay (Quakenbush 1988). Cetacean's sightings are rare in the upper Kuskokwim Bay and Kuskokwim River portions of the proposed transportation corridor. Reported sightings include are beluga whales, harbor porpoises, and killer whales. These species also occur in the eastern Bering Sea, along with Dall's porpoises, minke whales, and gray whales. All marine mammals are federally protected under the Marine Mammal Protection Act (MMPA) of 1972.

Expected Effects:

Alternative 1: No Action – This alternative would not affect marine mammals.

Alternative 2: Donlin Gold's Proposed Action – Direct and indirect effects of Alternative 2 on non-TES marine mammals would derive primarily from port site in-water construction and fuel and cargo barge traffic. Injury and mortality are unlikely given the slow vessel speed during river travel and the low occurrence of marine mammals in the Kuskokwim River portion of the EIS Analysis Area. Gray whales are not likely to occur in the EIS Analysis Area during the June 1 to October 1 shipping season, and faster moving cetaceans in the barge corridor (primarily Dall's porpoises and killer whales) could readily maneuver around cargo and fuel barges travelling between Dutch Harbor and Bethel. Few non-TES marine mammals occur in the vicinity of the Beluga barge landing in upper Cook Inlet. Harbor seals are seen in the vicinity of nearby rivers, such as the Susitna River, during summer months but numbers are highly variable. Potential effects would primarily involve behavioral disturbance. Anticipated effects would be of low intensity (no noticeable or lasting change in behavior), temporary in duration (displacement or behavioral changes would only occur during brief periods as barges pass by or for the period of in-water construction noise), and local in extent (disturbance would only occur in specific locations where construction or barge traffic coincide with individual marine mammals). All marine mammals, including those not listed under the ESA, are protected under the MMPA and are, therefore, important in context. The direct and indirect effects of Alternative 2 on non-TES marine mammals would be negligible to minor.

Other Alternatives: The effects of other alternatives on non-TES marine mammals would be similar to the effects of Alternative 2. Differences of note include:

- *Alternative 3A (Reduced Diesel Barging: LNG-Powered Haul Trucks)* – Decreased fuel barging and construction needs would reduce potential impacts associated with vessel traffic between Dutch Harbor and Bethel and at the mouth of and in the Kuskokwim River than those anticipated under Alternative 2.
- *Alternative 3B (Reduced Diesel Barging: Diesel Pipeline)* – Greatly reduced fuel barge traffic and construction needs in the Kuskokwim River and between Dutch Harbor and Bethel and would reduce potential impacts associated with vessel traffic from those anticipated under Alternative 2. Alternative 3B would require dock expansion and increased vessel traffic in Cook Inlet, transferring effects on marine mammals.

Birds

Summary of Existing Conditions:

The affected environment for birds includes the entire proposed Project Area plus all bird populations and habitat in the vicinity (within 5 to 10 miles) of all components of the proposed project due to their mobility. The area of potential effects also includes migration corridors in the vicinity and downgradient areas of habitat. The EIS Analysis Area lies in a region known to be exceptionally important bird habitat. A substantial portion of the global population of many species of waterfowl and shorebirds either breed or migrate through the Yukon-Kuskokwim Delta. Inland habitat supports thousands of migrant landbirds. Four species that have both a large portion of their populations in the EIS Analysis Area occur in high numbers (black scoter, Hudsonian godwit, black turnstone, and rock sandpiper).

Expected Effects:

Alternative 1: No Action – Minor impacts would continue from continued mineral exploration by Donlin Gold, and from reclamation of existing exploration and related disturbance (camp, roads, and airstrip) which may affect birds.

Alternative 2: Donlin Gold's Proposed Action – Moderate impacts could occur from the project as planned at the mine site. The proposed transportation facilities and pipeline could cause minor to moderate impacts. Standard design features are expected to reduce impacts at all three components to the levels defined.

The effects of Alternative 2 on birds would be low to medium intensity, with some changes, such as habitat loss, being acute. Some effects, such as disturbance from increased barge traffic, would be intermittent and some temporary (during the construction phase only), while the duration of other impacts could extend for the life of the project or beyond, such as habitat change at the mine site. The geographical extent of impacts would generally be within the Project Area, but may include migrating birds affected within the EIS Analysis Area. The context of impacts is common to important, but not unique, as impacts to threatened or endangered birds are discussed in Section 3.14, Threatened and Endangered Species. The overall direct and indirect effects of Alternative 2 on birds would be moderate.

Other Alternatives: The overall effects of other alternatives on birds would be very similar to the effects of Alternative 2. Although there are differences among alternatives in the project components that would affect birds (e.g., longer or shorter port road and pipeline, different operations at the mine site, and more or less barge trips), the summary impact levels are the same for all the alternatives because while the effects of one component may be reduced, impacts from the other components remain.

Other Species

The wood frog (*Rana sylvatica*), a species of concern for the BLM but otherwise not subject to any regulation or status, occurs within the EIS Analysis Area; but only general information about populations is known. No conclusions about effects can be made with current distribution information.

3.12.1 REGULATORY FRAMEWORK

The Marine Mammal Protection Act of 1972 (MMPA) prohibits the take of marine mammals in U.S. waters and by U.S. citizens on the high seas and the importation of marine mammals and marine mammal products into the U.S. without permit or exception. As defined under the MMPA, "take" means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." The MMPA defines "harassment" as "any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering". The MMPA provides exceptions for subsistence uses by Alaska Natives and authorized (permitted) scientific research. Also allowed, through a permit application process, is the "incidental," but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing). The National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) have regulatory authority for implementing the MMPA.

The Migratory Bird Treaty Act (MBTA) of 1918 makes it unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product, manufactured or not. Many species of migratory birds protected under this act are found in the EIS Analysis Area. The MBTA is administered by the FWS.

The Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c), enacted in 1940, and amended several times since then, prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The Act provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle... [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The Act defines "take" as "pursue, shoot,

shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." The Act is administered by the FWS.

Big game species and certain predators are managed by Alaska Department of Fish & Game (ADF&G) as game animals and as predators of game animals under state regulations. They also manage furbearers, game birds, and other species. On the Susitna Flats State Game Refuge the terms and conditions for the natural gas pipeline activity will be based upon existing lease conditions for oil and gas activity on the refuge.

In addition, several federal and state agencies and non-profit organizations have created Alaska-specific lists of bird species warranting special concern or conservation including the Bureau of Land Management (BLM), ADF&G, U.S. Geological Survey (USGS), FWS, and Audubon Alaska. While these species are not protected in the same ways as others mentioned in this section, they do receive added attention and a measure of protection.

The regulatory framework for the ESA is presented in Section 3.14.1, Threatened and Endangered Species.

3.12.2 KEY ISSUES

Key issues for wildlife were identified during agency and public scoping and further developed during interdisciplinary meetings with various subject-matter experts. Key issues are those with high interest because the potential effects would be on resources important as subsistence or recreational resources or that might directly or indirectly affect residents of the area. In addition, effects with the potential to affect protected species or to affect a large part of a population or extend over a large area may also be key issues. Key issues include:

- Increased access for hunters and trappers
- Habitat Loss
- Behavioral disturbance
- Increased risk of accidental environmental damage
- Exposure to contaminated water
- Exposure to contaminated dust

Key issues are discussed in the Environmental Consequences sections for each species group. See Section 3.24, Spill Risk, for a discussion of the potential for system failures that could lead to toxic releases and potential impacts on wildlife. Exposure to contaminated water and dust required additional analysis to determine the potential level of impact (presented in Sections 3.12.2.1 and 3.12.2.1.2).

3.12.2.1 ATTRACTION TO MINE SITE OPEN WATER AREAS – ECOLOGICAL RISK ASSESSMENT

Donlin Gold contracted for an ecological risk assessment (ERA) (ARCADIS 2013b; ERM 2015 – see Appendix S), examining the potential risk of exposure to toxic compounds and metals generated by the Donlin Gold Project that would be in the pit lake after mine closure. The ARCADIS ERA (2013b) focused only on the risk of exposure from the pit lake after closure. An addendum prepared in August 2015 assessed the potential risk of exposure to mine-related water sources (Tailings Storage Facility [TSF], Contact Water Dam [CWD] Ponds) available

during operations ERM 2015). The terms “ERA” or “streamlined ERA” henceforth include both the 2013 ERA and 2015 addendum. The streamlined ERA followed the ADEC (ADEC 2010, 2011c) and EPA (EPA 1998b) ERA format, including problem formulation, analysis, risk characterization, and evaluation of several representative terrestrial mammals and bird species. Pit lake, TSF, and CWD analyses are discussed below in separate sections.

3.12.2.1.1 ECOLOGICAL RISK ASSESSMENT FOR THE PIT LAKE

The pit lake water accumulation was defined in two stages after closure: filling stage (Year 2-52) and mature stage, after the lake was filled to capacity (Year 53 and beyond). The first ERA (ARCADIS 2013b) evaluated the potential for risk to terrestrial ecological receptors exposed to water accumulated in the open pit after closure, evaluating potential risk to birds for the filling stage of and to birds and mammals for the mature stage.

The assessment endpoints identified in the problem formulation section of the ERA include protection of reproduction, growth, and development of wildlife species that may utilize the pit lake as a drinking water source. Chronic effects on animals were evaluated in the ERA for these assessment endpoints. Chronic exposure for mammals is defined as more than 1 year, and/or over a critical life stage, and greater than 10 weeks for birds (Sample et al. 1996). Acute effects were not evaluated since they do not accurately represent potential adverse long-term risks associated with reproduction, growth, and development of wildlife populations.

Reproductive effects are considered one of the most sensitive measurement endpoints for a species, and therefore, a key response in assessing long-term chronic impacts on animals. Growth effects were considered acceptable but less desirable, because the relationship between growth and population-level effects is uncertain. Developmental effects were considered as a relevant factor in the selection of studies to derive Toxicity Reference Values (TRVs); but unless multiple developmental effects were evaluated in the study, the study was weighted less than other studies on growth or reproduction. Mortality is not a preferred endpoint for study selection because its effects are final and it is usually the cumulative result of other, sublethal, effects detected at lower exposures. The measurement endpoints selected were comparisons of modeled dietary chemical exposure of representative wildlife species to applicable and relevant effects concentrations (i.e., TRVs).

In the problem formulation stage, ecological receptors were identified. Ecological receptors represent wildlife that would be exposed through ingestion of plants, insects, small game, or a combination of food and prey. For the water accumulation stage of the open pit lake, four birds were identified as receptors: American dipper (*Cinclus mexicanus*), dark-eyed junco (*Junco hyemalis*), mallard (*Anas platyrhynchos*), and northern shrike (*Lanius excubitor*). Only birds were assumed to be exposed during this stage because the steep walls of the future open pit were assumed to exclude mammals from exposure to the surface water. For the mature lake stage, these avian receptors plus five mammals (black bear [*Ursus americanus*], gray wolf [*Canis lupis*], mink [*Mustela vison*], snowshoe hare [*Lepus americanus*] and tundra vole [*Microtus oeconomus*]) were used as receptors. The assessment endpoints used included protection of growth, reproduction, and survival of the wildlife receptors.

Chemicals or constituents of potential concern (COPCs) were selected by comparing modeled concentrations for the pit lake water against chronic water quality criteria from ADEC (2008a), EPA (2013j), or other sources. If the modeled concentration for either stage of the open pit lake

exceeded its chronic criterion or other threshold, it was identified as a COPC. Ten metals were identified as COPCs for the filling stage (antimony, arsenic, cadmium, chromium, cobalt, copper, lead, nickel, selenium, and zinc). Five metals (aluminum, antimony, arsenic, copper, and selenium) were identified as COPCs for the mature stage. Concentrations of the COPCs for each stage were based on the geochemical pit lake model of surface waters developed by Lorax (2012a). Additionally, potential future sediment concentrations in the pit lake were based on whole rock data from SRK Consulting (2007).

Several conservative exposure assumptions were used including: use of maximum estimated COPC concentrations in surface water and sediment; 100 percent bioavailability of metals in the ingested water, sediment, and food; and that wildlife are exposed exclusively, year-round (i.e., 100 percent of the time), to water in the pit lake. In particular, the assumption of 100 percent exposure for the receptors is overly conservative in view of several factors, including (among others):

- Migratory and seasonal patterns of wildlife,
- Poor habitat of very steep rock adjacent to the pit lake,
- No forage (food) along the margins of the pit lake, and
- Other natural water bodies in the vicinity of the pit lake with more food accessible.

Wildlife risks were estimated by comparing estimated ingested doses of each COPC for both pit lake stages to no observed adverse effect level (NOAEL) and lowest observed adverse effect level (LOAEL) doses for birds and mammals. These comparisons were estimated through the calculation of HQs.

Doses to each ecological receptor were estimated using the following equation which is the same equation presented as equation 1 in the ERA prepared by ARCADIS (2013b, 2015b):

$$\text{Dose} = (\text{SUF} \times ((\text{IR}_{\text{food}} \times \text{C}_{\text{food}}) + (\text{IR}_{\text{sed}} \times \text{C}_{\text{sed}}) + (\text{IR}_{\text{water}} \times \text{C}_{\text{water}}))) / \text{BW}$$

Where:

Dose = estimated daily dose of COPC from ingestion (mg/kg BW/day)

SUF = site use factor (unitless)

IR_{food} = amount of food ingested per day (kg wet/day)

C_{food} = Concentration of COPC in food items (mg/kg wet weight)

IR_{sed} = amount of sediment incidentally ingested (kg wet/day)

C_{sed} = Concentration of COPC in sediment (mg/kg wet weight)

IR_{water} = amount of water ingested per day (L /day)

C_{water} = Concentration of COPC in water (mg/L)

BW = body weight (kg fresh)

Two different reference doses were applied: no adverse effect levels (NOAELs) and low adverse effect levels (LOAELs). HQs were calculated for each ecological receptor as follows:

$$\text{HQ} = \text{Dose} / \text{NOAEL or LOAEL Dose}$$

The streamlined ERA relied on the methodology (assumptions and inputs) of the first ERA (ARCADIS 2013b) to apply the TSF and two CWD ponds. For example, the wildlife exposure factors compiled for the first ERA (ARCADIS 2013b) are used in the streamlined ERA. Additionally, the streamlined ERA for the TSF and CWD ponds focuses on representative species and chemicals of potential ecological concern (COPECs) selected from among those used in the first ERA (ARCADIS 2013b) that showed the highest calculated hazard quotients (HQs) for exposure to water, sediment, and food associated with the mature pit lake.

3.12.2.1.2 STREAMLINED ECOLOGICAL RISK ASSESSMENT FOR THE TAILINGS STORAGE FACILITY

Potential risks to the mallard were estimated for exposure to water in the TSF in the streamlined ERA (ERM 2015). This species was selected from among those used in the original ERA (ARCADIS 2013b) because it is the most likely representative receptor to occur (intermittently) at the TSF. Mining activities would result in fluctuating water levels, changing metals concentrations, and active deposition of tailings. There would be little opportunity for growth of vegetation or invertebrates along the margins of the TSF because it would be a lined facility and water levels would fluctuate. During operations, tailings would be added continuously and water would be pumped out of the TSF for reuse or treatment.

The deposited tailings would be warmer than ambient temperatures, but by the time the water separated, it would be close to ambient temperatures. TSF water would be expected to freeze in winter, so the liner and shape of the basin would be accordingly. Because of the warm tailings, during operations, the pond nearest where the tailings are deposited (six locations) may freeze later or thaw earlier than natural water bodies. If open water sources were available earlier in the spring at this facility than in surrounding water bodies, it might attract migratory water birds. However, without food, birds would not likely stay very long. The primary exposure for birds would be from drinking the water while resting there.

HQs for the TSF were estimated for the five metals (aluminum, antimony, arsenic, copper, and selenium) that were identified as chemicals of potential concern (COPCs) in the original ERA 2013b. All input variables used in the ERA for the mature pit lake, except for water concentrations, were used in the risk calculations. Estimated concentrations of metals (milligrams per liter [mg/L], dissolved) in the TSF used in the risk calculations were taken from Table H-8 (see Appendix H, Geochemistry). As in the original ERA for the filling stage of the pit lake (ARCADIS 2013b), it was conservatively assumed that the mallard was exposed to drinking water 100 percent of each year and that bioavailability of metals in water was 100 percent.

The HQ_{LOAELS} for the mallard exposed to water in the TSF are summarized in Table 3.12-1 below:

Table 3.12-1: HQ_{LOAELS} for Mallard Exposure to Water in the TSF

COPC	HQ
Aluminum	7.0E-07
Antimony	1.4E-04
Arsenic	2.7E-03
Copper	3.6E-05
Selenium	1.5E-03

The mallard is not at risk in the TSF even with the conservative assumption of 100 percent exposure to water in the TSF. Additionally, the TSF, which would be an active component of the mine during its operation, would not be an attractive or exclusive source of water for birds. Other nearby water sources such as Crooked Creek and its tributaries and the Snow Gulch freshwater reservoir would be accessible. Considering more representative exposure assumptions, the lack of attractive habitat features, and chronic intense disturbance from mining equipment, mallards are not expected to be at risk due to ingestion of water from the TSF.

3.12.2.1.3 STREAMLINED ECOLOGICAL RISK ASSESSMENT FOR THE TWO CWD PONDS

Potential risks to three representative wildlife receptors (mallard, American dipper, and tundra vole) were estimated for exposure to water in the Upper and Lower CWD ponds. These species were selected from among those used in the first ERA (ARCADIS 2013b) because they had the highest calculated HQs for exposure to water, sediment, and food associated with the mature pit lake and mallards represent migratory birds. All other species evaluated in the ERA for the mature pit lake have lower HQs, and therefore, are expected to be at lower risk. The mallard represents birds that eat aquatic insects and plants, American dipper represents birds that eat aquatic insects, and tundra vole represents small mammals that eat plants. HQs for the Lower and Upper CWD ponds were estimated for the five metals (aluminum, antimony, arsenic, copper, and selenium) that were identified as COPCs in the ERA of the mature pit lake.

Upper and Lower CWD ponds would be different in character. The lower CWD pond would be surrounded by active waste rock storage and would not have adjacent or nearby natural landscape that might be wildlife habitat except along the south shore for the first few years of mine operations. It would receive all of the contact water directed to a CWD pond from other facilities, and it would intercept the drainage from the waste rock storage areas, including the potential acid-generating (PAG) PAG 6 rock area. Water would be pumped in and out of it frequently, so the level would be expected to fluctuate, with the drawdown area being barren. The Upper CWD Pond would be built above the WRF in the American Creek drainage and would be surrounded on all sides, except the dam side, with natural landscape that would be wildlife habitat. Its primary function would be to store runoff water for use by mine-related activities. Secondly, it would serve as storage for excess contact water when the Lower CWD Pond is full, in which case, water would be pumped from the Lower to the Upper CWD pond.

Therefore, the water quality of the Upper CWD Pond is expected to be generally much better than the Lower CWD Pond, and only be a concern when the Lower CWD Pond water quality is

poor and pumping from the Lower CWD Pond is extensive enough to dominate the water in the Upper CWD Pond. The Upper CWD Pond would also have less fluctuation in its water level. Water could be pumped from it at any time it is needed for process water or to go to the water treatment facility, but it would have fewer fluctuating inputs. Shores may be vegetated and could provide good habitat values for some species.

HQs for the CWD ponds were estimated for the five metals (aluminum, antimony, arsenic, copper, and selenium) that were identified as COPCs in the first ERA (ARCADIS 2013b) of the mature pit lake. Estimated concentrations of metals (milligrams per liter [mg/L], dissolved) in the TSF used in the risk calculations were taken from Table H-6 for the Lower CWD Pond and H-7 for the Upper CWD Pond (See Appendix H). As in the first ERA for the filling stage of the pit lake (ARCADIS 2013b), it was conservatively assumed that the mallard, dipper, and vole were exposed to drinking water, sediment, and food 100 percent of each year and that bioavailability of metals in water, sediment, and food was 100 percent.

The HQ_{LOAELS} for the mallard, dipper, and vole exposed to water in the Upper and Lower CWD Ponds are summarized in Table 3.12-2 and Table 3.12-3 below:

Table 3.12-2: HQ_{LOAELS} for Representative Receptors in the Lower CWD Pond

COPC	Mallard HQs	Dipper HQs	Vole HQs
Aluminum	2.3E-01	8.7E-02	8.0E-01
Antimony	6.1E-02	2.2E-01	1.8E-01
Arsenic	3.3E-01	9.2E-01	6.8E-01
Copper	7.6E-02	4.5E-01	3.9E-03
Selenium	8.0E-02	4.2E-01	9.0E-02

Table 3.12-3: HQ_{LOAELS} for Representative Receptors in the Upper CWD Pond

COPC	Mallard HQs	Dipper HQs	Vole HQs
Aluminum	2.3E-01	8.7E-02	8.0E-01
Antimony	5.9E-02	2.0E-01	1.5E-01
Arsenic	3.3E-01	9.1E-01	6.6E-01
Copper	7.6E-02	4.5E-01	3.9E-03
Selenium	7.7E-02	3.8E-01	7.0E-02

The mallard, dipper, and vole are not at risk in either the Upper or Lower CWD ponds even with the conservative the assumptions of 100 percent exposure to water, food, and sediment in the ponds. Additionally, as described for the TSF, the lack of attractive food sources or other habitat features, chronic intense disturbance from mining equipment, and the availability of other nearby water sources would also minimize the risk of wildlife exposure to water from the CWD Ponds.

The design of the mine site and the water management plan minimize the risk of untreated water escaping the mine site and going downstream. See Section 3.24.5, Spill Risk, for a discussion of the potential for system failures that lead to toxic releases into the environment.

3.12.2.2 POTENTIAL RISK FROM DUST DEPOSITION

The potential for risk to terrestrial organisms from the deposition of particulates from mine construction and operations on surrounding soil was evaluated for metals. As described in Section 3.2, Soils, fugitive dust would be generated by processes such as drilling and blasting in the pit, waste rock and ore handling, road traffic, and wind erosion of exposed surfaces such as ore stockpiles and tailings beaches. Fugitive dust generated during construction and operations could potentially result in increased concentrations of metals in soils surrounding the mine site over time through dust deposition. The dust particulates would reflect the minerals in the source material. Dust generated during road construction and from road use during mine construction and operation could potentially result in elevated concentrations of certain metals in soils near the road over time through dust deposition. Potential fugitive contaminants of concern include mercury, arsenic, and antimony, metals exceeding ADEC cleanup levels in baseline or potential dust sources.

In order to evaluate the potential for risk to terrestrial organisms, these estimates of shallow soil concentrations at the 35th year of mine life (3.5 years of construction + 27.5 years of operations + 4 years of reclamation) resulting from particulate deposition are compared to the most recent lowest observed effect concentrations (LOECs) from Los Alamos National Laboratory (LANL 2014) (Table 3.12-4). The selected LOECs are the lowest of LOECs protective of plants, soil invertebrates, birds, and mammals. Mean concentrations in baseline soil also are compared to LOECs.

Table 3.12-4: Potential Risk from Metals (Baseline and 35th Year)

Metal	LOEC ¹ (mg/kg)	Baseline Soil (mg/kg) ²	Soil in Year 35 (mg/kg) ²	Baseline Exceeds LOEC?	End of Mine Life Exceeds LOEC?
Antimony	24	11.1	11.2 ³	No	No
Arsenic	24	169	172 ³	Yes	Yes
Mercury	0.13	0.415	0.461 ³	Yes	Yes

Notes:

- 1 Lowest of lowest observed effect concentrations (LOECs) protective of plants, soil invertebrates, birds, and mammals from LANL (2014).
- 2 Based on 95% UCL concentrations in shallow soil (Fernandez 2014a).
- 3 See Table 3.2-13 in the Soils Section.

As seen in this table, there is no difference in the potential for ecological risk to terrestrial organisms between current baseline concentrations in shallow soil and estimates of concentrations in the 35th year of the mine life due to the deposition of particulates from mine operations. For arsenic and mercury, both baseline and 35th year concentrations may pose a risk to terrestrial organisms.

In conclusion, the deposition of particulates on surface soil surrounding mine operations is not expected to pose a risk to terrestrial organisms different from the risk from baseline concentrations.

3.12.3 TERRESTRIAL MAMMALS AND AMPHIBIANS

3.12.3.1 AFFECTED ENVIRONMENT

3.12.3.1.1 GENERAL HABITAT TYPES IN THE PROJECT AREA

The following paragraphs provide a brief description of the wildlife habitat types within each of the three main project components. Additional information is described in Section 3.10, Vegetation, and Section 3.11, Wetlands.

Mine Site

The area including and surrounding the proposed mine site is characterized by rolling hills that support a boreal forest (taiga) ecosystem. Black spruce (*Picea mariana*) forest is the dominant vegetation community within the area; other habitat types include alpine tundra, herbaceous wetland, shrub, broadleaf forest, and mixed forest.

Transportation Facilities

The Kuskokwim River is about 10 miles wide at the mouth, about 1/2-mile wide at Bethel, and about 1/3-mile wide at Angyaruaq (Jungjuk) Port, creating a natural barrier to movement for many terrestrial mammals during the open-water season. Strong swimming mammals such as moose, caribou, beavers, and wolves may cross the river, especially in areas with mid-channel islands. These species and others may also cross the river on the ice during the winter. The large Kuskokwim Delta is mostly treeless and dominated by marsh vegetation including sedges (*Carex* spp.), grasses, and herbaceous plants. Further upriver, the riparian areas become brushy and forested.

The mine access road from either the proposed BTC or Angyaruaq (Jungjuk) ports would traverse a variety of vegetation types. The road from Jungjuk would be shorter and would pass through primarily coniferous and mixed/deciduous forests and shrub habitats. The mine access road from Birch Tree Crossing would be longer and pass through the same types of habitats but would also traverse open, herbaceous areas.

Pipeline

The proposed pipeline route extends from approximately sea level near Cook Inlet through the Susitna Flats State Game Refuge, over the Alaska Range at an elevation of approximately 3,000 feet, then across tributaries of the Kuskokwim River to the proposed mine site. This route passes through numerous sub-climates. The southernmost tip of the EIS Analysis Area originates near Tyonek and Beluga and is in the Susitna Flats Game Refuge, which is characterized by extensive wet and low shrub habitats. North of the pipeline tie-in, a largely mixed forest habitat type is found along the larger river drainages. Large patches of herbaceous habitat (wet, graminoid sedges and grasses) are associated with water bodies, especially north of the Skwentna River. The steep mountain slopes in the corridor occasionally support tall

shrub habitat, but most often are barren or have alpine, low shrub, or sparse vegetation habitats. Most of the area west of Rainy Pass and Big River is black spruce forest with large areas of land that has burned in numerous forest fires. In the lowlands east of the Kuskokwim River, herbaceous and wet low shrub habitats comprise wet areas surrounded by black spruce forest habitats, while mixed wood and broadleaf forest habitats border rivers and streams. Lowlands to the west of the Kuskokwim River to the proposed mine site include black spruce forest and shrub habitats. Tall shrub, mixed wood, and broadleaf forest habitats are located on the lower mountain slopes. Mountain tops and upper slopes are covered with sparse alpine vegetation and dwarf and low shrub habitats.

3.12.3.1.2 LARGE MAMMALS/BIG GAME

The species discussed in this section are managed by ADF&G as game animals and as predators of game animals, are considered important ecologically and highly valued by subsistence communities throughout the EIS Analysis Area as well as sport hunters. They are also highly valued by many residents and visitors for non-consumptive wildlife viewing and aesthetics.

Moose (*Alces alces*)

Moose are established throughout forested and shrubby areas of Alaska, especially in areas where fires occurred between 15 and 20 years before and browse production and cover is abundant (Rausch et al. 2008). Moose feed on sedges (*Carex* spp.), horsetails (*Equisetum* spp.), pondweeds, and grasses in the spring; shallow pond vegetation and forbs in the summer; and willow (*Salix* spp.), birch (*Betula* spp.), and cottonwood (*Populus* spp.) twigs throughout the fall and winter. Moose breed in late September and October, with adult bulls going into “rut” and competing for cows. Cow moose usually begin breeding at 28 months, although some start as early as 16 months, and continue every year for the rest of their lives. Moose rarely live beyond 16 years of age. One or two calves (rarely three) are born in late May to early June. The bond between cow and calf continues for a year until just before the next calf is born, at which point the mother chases off her 1-year-old. Some moose inhabit relatively small areas throughout their lives but most make seasonal migrations up to 60 miles between calving, rutting, and wintering areas. Natural predators of moose include wolves, brown bears, and black bears. In areas with roads, moose are often killed in accidents with cars, especially at night. Moose are attracted to the packed snow or cleared roadways for travel and roadside vegetation (Rausch et al. 2008).

In many areas of Alaska, moose are the most sought after big game animal and are valued for their meat as well as traditional sources of hides for clothing and other purposes. Hunting pressure is generally very high in areas near roads and rivers accessible by power boats. The State Board of Game and ADF&G manage hunting pressure through hunting seasons, sex/size limits as well as closure areas and limited permit hunts. In recent years, the state has implemented predator control programs against wolves and bears in an effort to increase moose available for human harvest. Hunting regulations vary considerably throughout the EIS Analysis Area.

Mine Site

The proposed mine site is located in the north central part of game management unit (GMU) subunit 19A (Figure 3.12-1). ADF&G considers moose abundance in the region to be well below

the density that the habitat can support. Moose densities in GMU 19A ranged from 0.27 to 0.44 observable moose/square mile (mi²) during ADF&G aerial surveys from 2005 to 2010, and 0.25 observable moose/mi² (Holitna area) in 2011. These densities are substantially lower than management goals for the region (0.75-0.93 moose/mi²) (Seavoy 2012a). Indicators of population health (bull:cow ratio, calf:cow ratio, and calf survival) were mixed in different subsections and survey years, with indicators exceeding or meeting management goals only in certain areas in 2009 or 2010 (the last years for which data is publicly available). More aggressive predator control measures for bears were implemented in 2013 to help the moose population reach the intensive management objectives (Seavoy 2012a).

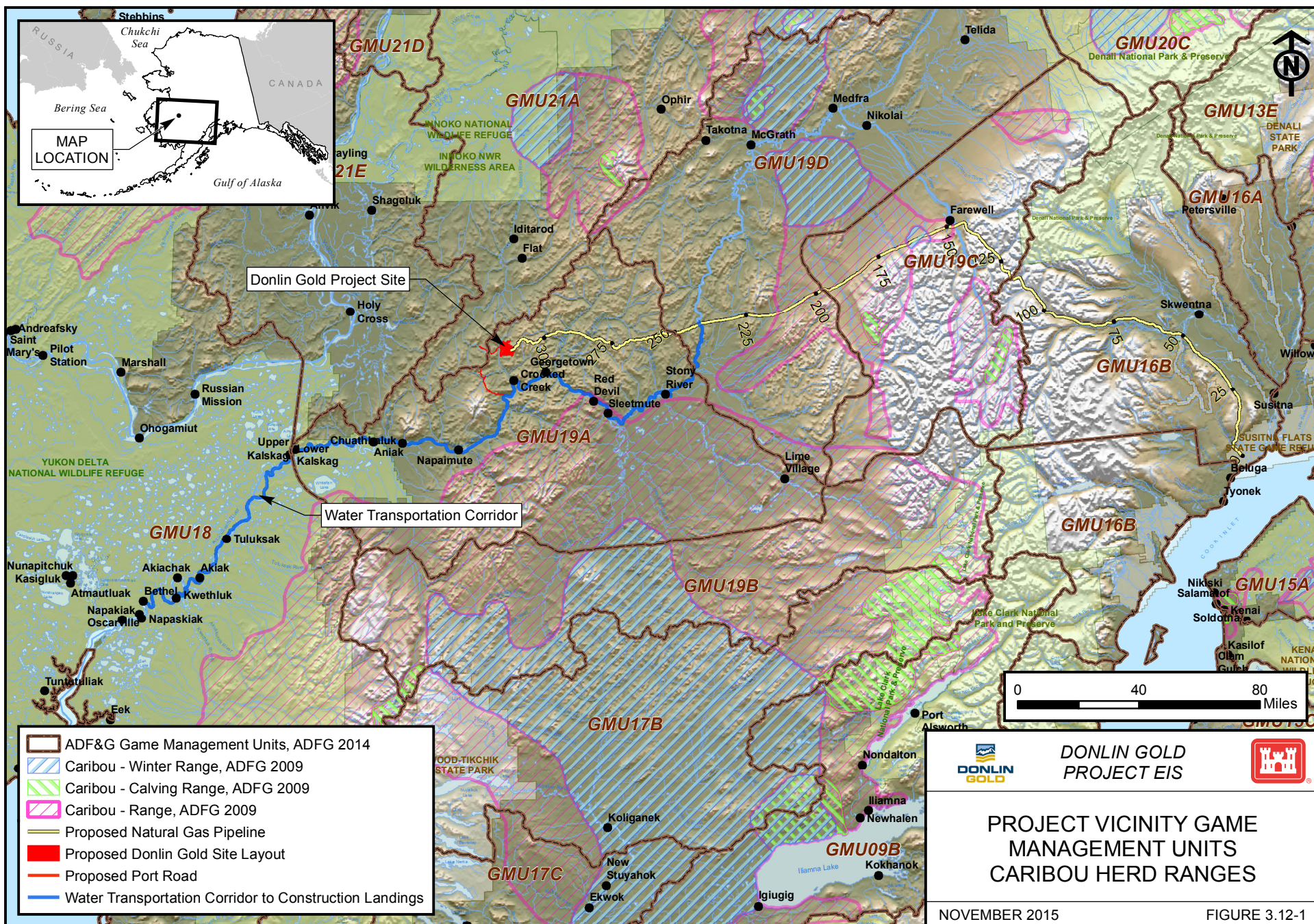
The Donlin Gold Project has conducted a series of aerial moose surveys in the mine site area since 2006 (ARCADIS 2013a) and found relatively low moose densities throughout the study area. Habitat types in the area are dominated by black spruce forest, alpine ridges, open tundra, and hills covered with thick alder that do not support high quality winter forage for moose.

Transportation Facilities

The proposed transportation corridor between Kuskokwim Bay and the mine site occurs in GMU 18 and GMU subunit 19A. The moose population status in GMU 19A is described in the mine site section above. Much of GMU 18 consists of the Yukon Delta National Wildlife Refuge to the north and the Togiak National Wildlife Refuge to the south. Moose began spreading into the Yukon-Kuskokwim Delta in the 1940s and the population along the Kuskokwim is still small; hunting pressure has limited the growth rate, although riparian habitat appears to be available for expansion (Perry 2012). ADF&G aerial surveys indicate that moose densities increased substantially in the Lower Kuskokwim area from 2004 to 2011, with the latter estimates at 0.8 moose per mi². The population in this area appears to be growing primarily through continual immigration from surrounding areas (Perry 2012). Moose were consistently sighted during fall aerial surveys conducted by Donlin contractors at the western base of the Russian Mountains, the hills west of the Owhat River, and the hills north of the Kuskokwim River (ARCADIS 2013a).

Pipeline

The western portion of the proposed pipeline route passes through GMUs 19A, 15F, 19D, and 19C, which are subject to intensive management efforts to provide high levels of moose harvest, including predator control programs on wolves and bears. Moose densities in GMU 19A are below management goals, as described above. ADF&G only conducts moose surveys in parts of GMU 19D and does not conduct systematic surveys in the many areas through which the proposed pipeline would pass. However, based on the similarity of habitats in these areas to the habitats in surveyed areas, ADF&G expects moose densities to be relatively low (i.e., around 0.5 moose per mi²) (Seavoy 2012a). Population data for GMU 19C are limited, but moose densities are believed to be similar to what they were in the late 1980s and early 1990s. The Donlin Gold Project aerial moose survey in 2011 (ARCADIS 2013a) found relatively high densities of moose in areas around Farewell (GMU subunit 19C), while lower densities were observed to the west. The lowlands that dominate the northern edge of the Alaska Range have alternating patches of shrub, black and mixed spruce forest, with herbaceous patches larger and more numerous to the west. Moose in this area were most commonly observed in tall shrub habitat.



The eastern portion of the pipeline route crosses portions of GMU 16B east of the Alaska Range in the Cook Inlet drainage. The most recent ADF&G population estimate for GMU 16B (2008 to 2010 data) was 3,597 to 6,039 moose, which was below the management target of 6,500 to 7,500 moose in the area (Peltier 2012a). The bull:cow ratio varied from 39 to 78 bulls per 100 cows depending on year and area surveyed, compared to the target ratio of 20 to 25 bulls per 100 cows, which favors a recovering population. Twinning rates and other nutritional indices suggest habitat quality is not limiting the population (Peltier 2012a). The population has not recovered since a severe winter die-off in 1999-2000 and has been impacted by relatively high predation from wolves and black bears, which are not subject to predator control programs in this area. Hunting regulations are intended to moderate hunting pressure to help the population recover.

The Donlin Gold Project conducted an aerial moose survey in 2011 and found that high densities of moose were observed along the southern portion and terminus of the proposed natural gas pipeline (ARCADIS 2013a). Other areas surveyed indicated low population densities of moose. The east side of the Alaska Range from the origin of the proposed natural gas pipeline near Beluga along the east-facing slopes of Little Mount Susitna, the west-facing slopes of Mount Susitna, and northeast along the Skwentna River, has large expanses of shrub-like habitat. At higher elevations, low shrub and herbaceous communities predominate while at lower elevations, (wet) low shrub communities prevail. The majority of moose in this area were observed in tall shrub habitat, followed by herbaceous and mixed forest.

Caribou (*Rangifer tarandus*)

Caribou live in the Arctic and alpine tundra as well as forested habitats throughout Alaska. Many separate herds are recognized in Alaska, distinguished by their separate calving grounds, although animals from different herds often mix together on winter ranges. Caribou are primarily grazing animals, feeding on sedges, mushrooms, and herbaceous plants in summer and lichens in winter, although they also eat leaves from shrubby plants such as willows (Valkenburg and Arthur 2008). Caribou travel almost constantly to find food and to find the most favorable conditions for the season. Caribou breed in the fall and calves are born in late May and early June. Predation on newborn calves is often substantial, with brown bears, wolves, and golden eagles contributing. Caribou often join in large “postcalving aggregations” to avoid predation and these large groups seek out cooler windblown ridges and coastal areas in the summer to minimize mosquito harassment and parasitic flies. In the fall they move to rich forage areas, often in smaller groups, where they build fat reserves for the winter. Deep snow requires a great deal of energy to walk through and buries food sources, so caribou try to find windblown or other low-snow areas to survive the winter.

Caribou is an important game animal in Alaska, especially in areas where their migration routes pass near subsistence communities, valued for their meat and hides but are also popular with non-resident trophy hunters. Hunting is managed through hunting seasons, sex and size limits, bag limits, and closure areas and limited permit hunts. In recent years, the state has implemented extensive predator control programs against wolves and bears in an effort to increase caribou available for human harvest. Hunting regulations vary considerably throughout the EIS Analysis Area.

Mine Site

The Mulchatna caribou herd occurs in GMU subunit 19A, but their range is typically south of the mine site. The latest Mulchatna herd census (2008 data) indicated at least 30,000 caribou, which is at the low range of the management goal for this herd (Woolington 2013). Bull:cow ratios have been lower than management goals, indicating an unfavorable social structure that could reduce population growth. The Beaver Mountain herd ranges to the north of the mine site, primarily within GMU 21A. This herd was most recently surveyed in 2011 and 2012 in conjunction with the Sunshine Mountain herd. The estimate for both herds was 1,000 to 1,250 caribou and the population appears to be stable or growing (Seavoy 2013a). Animals from either of these herds could be present in the mine area at various times. Incidental caribou observations have been made during Donlin Gold wildlife surveys but only small numbers have been observed; caribou tend to be infrequent migrants through the mine site.

Transportation Facilities

Animals from the Mulchatna herd are the most likely to occur within the proposed transportation corridor between Kuskokwim Bay and the mine site. As noted above, the Mulchatna herd tends to concentrate in areas well south of the Kuskokwim River, but small numbers of animals may infrequently travel into the proposed corridor. The Donlin Gold Project's wildlife surveys along the Kuskokwim River did not observe caribou (Jewett et al. 2010b).

Pipeline

In addition to the Mulchatna and Beaver Mountain herds to the south and north of the ROW near the mine site, several other caribou herds occur along the proposed pipeline route. In GMU 19D and 19C, the proposed pipeline would cross the range of the Big River-Farewell herd, including part of the traditional winter range along the northern foothills of the Alaska Range. ADF&G has not conducted systematic population surveys of the Big River-Farewell herd since 2004, when it was estimated to have 750-1,500 caribou, but incidental sightings during other wildlife surveys and reports from hunters have led ADF&G to believe the herd now numbers about 500 to 750 animals (Seavoy 2013a).

The pipeline corridor also passes near the range of the Rainy Pass herd as it crosses the Alaska Range. Information on the herd's abundance is limited and similar to the Big River-Farewell herd; the population was estimated at 1,500-2,000 animals in 2004 but has likely declined to 500 to 750 animals since that time (Seavoy 2013a). For both the Big River-Farewell herd and Rainy Pass herd, hunting success is well below management goals and habitat quality does not appear to be limiting population growth.

The Donlin Gold Project has not conducted any standardized study of caribou along the proposed pipeline corridor, but incidental observations of caribou have been made during other pipeline alignment surveys (ARCADIS 2013a). The herd affiliations of these caribou could not be determined.

Brown Bear (*Ursus arctos*)

Brown bears are widespread and common in many areas of Alaska, including the Kuskokwim River and Cook Inlet drainages, because of huge salmon runs that provide an abundant source

of protein. In northern and interior parts of Alaska, brown bears are often called “grizzly bears” and are typically smaller than brown bears along the coast, although they are the same species. Since the EIS Analysis Area includes both coastal and interior habitats, these animals will all be referred to as brown bears to avoid confusion. Brown bears eat berries, leaves, and roots of many plants and prey on a variety of small and large mammals (Eide et al. 2008). Brown bears use a variety of habitats, including alpine and subalpine meadows, coastal sedge meadows, riparian areas, and forests. Brown bears often concentrate along salmon streams in the summer, move to higher elevations in the fall for berries, and hibernate for the winter in caves or under trees and shrubs. Mating occurs in the spring (May into July) (Eide et al. 2008). Two cubs are typically born in January or February in the den and stay with their mother for two or three years. Sows with cubs are very protective and can be exceedingly dangerous when approached. The only predators of brown bears are other brown bears and humans. Population success is heavily dependent on the quality of late summer habitat and forage, which are critical for bears to store enough fat for hibernation.

Brown bear hunting is regulated by ADF&G and managed by GMU, but ADF&G does not conduct brown bear population surveys in the region. In 2001, ADF&G established an intensive management area in GMU 19D around McGrath (approximately 20 mile radius) to study the effects of predator control programs around McGrath and to provide more moose for human harvest. This area was renamed the Bear Control Area in 2009. Management goals in the rest of GMU 19 and 21A are less intensive.

Mine Site

ADF&G has estimated population levels of brown bears in GMU 19 on the basis of habitat quality and known bear densities in similar habitats (Peirce 2013). In GMU 19A, habitat quality is considered moderate and capable of supporting 20 bears per 1,000 mi², or 200 bears in GMU 19A. The Donlin Gold Project has not conducted any surveys specifically for brown bears, but they have been observed infrequently during avian surveys, most often near the Russian Mountains.

Transportation Facilities

Brown bears in GMU 18 are concentrated in the Kilbuck Mountains southeast of Bethel and in uplands along the Yukon River. There are high densities in these high quality habitat areas but few brown bears live in other areas of GMU 18 (Perry 2013). The Donlin Gold Project’s wildlife surveys along the Kuskokwim River did not observe brown bears (Jewett et al. 2010b). They have been observed infrequently during avian surveys, most often near the Russian Mountains.

Pipeline

ADF&G considers brown bear habitat in GMU 19D to generally be of poor quality, capable of supporting 15 bears per 1,000 mi², or 185 bears in GMU 19D. GMU 19C has a mix of good quality habitat (capable of supporting 50 bears per 1,000 mi²) and moderate quality habitat and is considered capable of supporting 290 bears in GMU 19C. In GMU 16B, on the southern side of the Alaska Range, ADF&G conducted line transect surveys in 2007 and estimated brown bear densities of about 69 bears per 1,000 mi², although densities were much higher in the southern and western sections of the GMU than the north and east sections. ADF&G also uses harvest data and reports from long-term residents to track population trends. Currently ADF&G

estimates there are 625-1,250 brown bears in GMU 16B. The Board of Game and ADF&G have made several changes to hunting regulations in GMU 16B to increase the take of brown bears in an effort to reduce the population and foster higher moose survival, including a brown bear control program between the Beluga and McArthur rivers (Peltier 2013).

Black Bear (*Ursus americanus*)

Black bears are widely distributed in North America and are common in forested areas of Alaska. Black bears feed primarily on new plant growth in spring, berries during summer, and spawning salmon during summer and fall (Johnson 2008). Many of the foods preferred by black bears, such as grasses, sedges and forbs, grow best in openings near forest habitats such as wetlands, avalanche slopes, burned and logged areas, and subalpine meadows (Ulev 2007). Winter den sites include excavated and natural depressions under tree roots, stumps, and fallen logs. Black bears hibernate between four and seven months out of the year, usually between October and May. Mating typically occurs in June and July. One to four cubs are born in the den between November and February, and females give birth every two or three years (Johnson 2008). During spring and fall, black bears migrate between the higher elevation dens and lower elevation woodlands.

Black bears are highly adaptable and can tolerate moderate disturbances from humans as long as basic requirements for food and cover are satisfied. However, they are often attracted to human garbage and food and this often leads to human-bear conflicts in residential areas and construction camps, which is very dangerous for bears as well as human safety. ADF&G does not require black bear skulls or hides to be sealed (recorded at an ADF&G office) in GMU 19 so harvest information is not available for this unit. The number of bears killed in defense of life and property is small in the EIS Analysis Area.

Mine Site

ADF&G has only conducted black bear population surveys in the Bear Control Area around McGrath but estimates that GMU 19A contains 2,475-2,970 black bears based on habitat similarities with areas of known density (Peirce 2011). Donlin Gold Project biologists have observed black bears during all avian surveys and they appear to be the most abundant large mammal in the proposed mine site area (ARCADIS 2013a).

Transportation Facilities

Black bears are typically not present in GMU 18 and ADF&G does not report on their status in that area. The Donlin Gold Project's wildlife surveys along the Kuskokwim River did not observe black bears (Jewett et al. 2010).

Pipeline

Based on known bear densities in similar habitat in other GMUs, ADF&G estimates that 3,000-6,000 black bears live in GMU 19D and 975-1,165 live in GMU 19C. ADF&G has implemented liberal hunting and baiting rules for black bears in GMU 19D with the intent of reducing predation pressure on moose calves, but the numbers of bears harvested is well below management goals and the effectiveness of this strategy is limited (Peirce 2011). ADF&G estimates that there are 3,200-3,800 black bears in GMU 16B, although the management goal is

to reduce this population substantially through liberalized hunting and baiting rules and other control strategies (Peltier 2011).

Dall Sheep (*Ovis dalli dalli*)

Dall sheep live in all major mountain ranges of Alaska, occupying alpine tundra and bare scree slopes with steep, rocky escape terrain nearby. They generally remain on high elevation slopes, but periodically cross mountain passes and gorges to reach preferred habitat (Olson et al. 2008). Ewes disperse to have their lambs in spring but then soon join together in “ewe bands” for group protection from predators, including golden eagles, bears, and wolves. Rams travel in their own bands and generally do not mix with ewe bands except during the fall mating season or at mineral licks. Sheep are sensitive to disturbance from humans on the ground or in low flying aircraft and will flee to rugged escape terrain (Olson et al. 2008).

Suitable habitat for Dall sheep does not exist in the proposed mine site area, the transportation corridor along the Kuskokwim River, or the proposed pipeline ROW outside of the Alaska Range. The pipeline route crosses the Alaska Range from approximately MP 50 through 180, and suitable habitat for Dall sheep is adjacent to the route between these mileposts. Sheep in this area are part of an ADF&G management subunit called the Alaska Range West population. ADF&G has not produced overall population estimates in this area but has conducted aerial surveys to track population trends on a density per mile basis and monitors sheep harvest through sealing requirements (Seavoy 2011a). The Alaska Range West population appears to have increased from 2008 to 2010, while harvest levels are below management objectives. The highest concentrations of Dall sheep are on the northwest side of the Alaska Range near Rainy Pass because snow depths are characteristically less than on the southeast side of the Range. The pipeline route also passes near a mineral lick southwest of Farewell Mountain. This lick is used by Dall sheep as well as bison, and the surrounding area has extensive game trails (ARCADIS 2013a).

Bison (*Bison bison*)

A small number of American plains bison were transplanted from Delta to the Farewell area north of the Alaska Range in 1965 and 1968 to provide hunting opportunities. The herd has been subject to a limited permit hunt since 1972 and grew to 350 animals by 1999. The highest number counted was 330 animals in 2012. Although fewer animals were counted in a 2013 survey, ADF&G believes there were sightability issues in 2013 and that the population of the herd appears to be growing slowly (Seavoy 2014). The plains bison in Alaska herds originated from animals transported from Montana in 1928. They graze on grasses and forbs but also eat shrubby plants such as willows and birch (Griffin et al. 2007). They are attracted to burned areas and other early successional areas because of good grazing habitat, and part of ADF&G's management plan includes controlled burns to keep parts of the bison range in this favorable condition (Peirce 2012). Calves can be born from April through August, but most are born in May. Bison are often dispersed rather than in one herd, and the animals move between seasonal ranges (Griffin et al. 2007). The Farewell herd ranges from the east side of the South Fork of the Kuskokwim River to Windy Fork to the west, an area that is bisected by the proposed pipeline route between approximately MP 150 and MP 165 on the north side of the Alaska Range (Figure 3.12-2). The Farewell mineral lick is used frequently by bison and is located about one-half mile from the proposed pipeline route (Owl Ridge 2013a).

One hundred wood bison were released in spring 2015 by FWS near the village of Shageluk into the Innoko Flats Wildlife Refuge. The potential range includes sections of the Kuskokwim River corridor, although no information is yet available about population distribution or range.

Gray Wolf (*Canis lupus*)

Wolves occur throughout most of Alaska, including the entire EIS Analysis Area. They are highly adaptable to different habitats and prey on a wide variety of large and small mammals as well as fish and birds (Stephenson and Boertje 2008). Wolves are social animals and live in packs of 2 to 12 or more animals, which include young from 1 or more females. Breeding occurs in February and March, and four to seven wolf pups are born in May and early June. The pack remains near the den until mid-summer, when the pups are big enough to travel; packs may travel 10 to 30 miles a day in the winter in search of prey (Stephenson and Boertje 2008).

Because they often prey on large mammals, which are also hunted by humans for food, wolves have often been subject to intensive hunting and trapping efforts to reduce their numbers and thereby improve survival of game animals and support higher human harvests of game. The Board of Game has mandated the implementation of predator control programs and harvest goals to reduce populations of predators, including wolves, in some areas of the EIS Analysis Area, as described in the moose and bear sections above. In addition, wolves are often trapped by Alaska residents and prized for their fur. They are also frequently hunted as trophy animals, especially by non-resident hunters who employ local guide services.

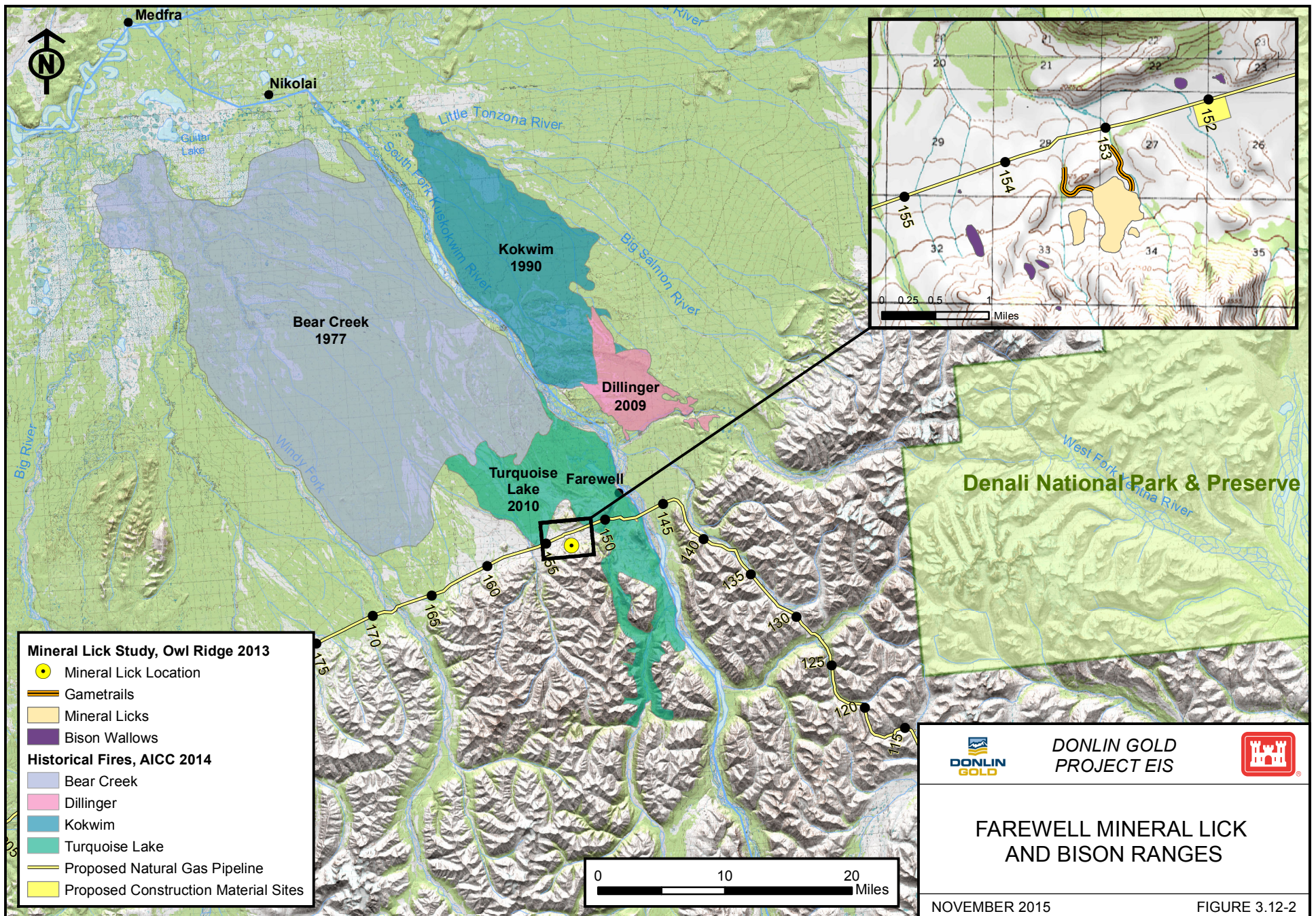
Mine Site

ADF&G used a number of different data sources to estimate and track population trends of wolves in GMU 19A: aerial reconnaissance track surveys in the winters of 2006, 2008, and 2011, wolf surveys in adjacent GMU subunits, wolf research data, harvest records, and hunter/trapper interviews and questionnaires (Seavoy 2012b). ADF&G used this information to make a fall 2005 population estimate of 119-133 wolves (12-13 wolves per 1,000 mi.²) and a 2008 estimate of 80 wolves in GMU 19A (Seavoy 2012b).

Wolf tracks observed during numerous Donlin Gold aerial surveys indicate that wolves are common inhabitants of the mine site, an impression backed by reports from local residents (ARCADIS 2013a). In addition, the Donlin Gold camp personnel have reported that a wolf pack was seen near the current exploration camp area on a number of occasions throughout the winters of 2008, 2010, and 2011 (ARCADIS 2013a).

Transportation Facilities

Wolves appear to be increasing in GMU 18 along the Kuskokwim River in response to the increasing numbers of moose in the region (Jones 2009). ADF&G does not conduct wolf surveys in this area but relies on reports of residents and incidental sightings during other surveys to monitor wolf population trends. Based on that information during the 2008 to 2011 reporting period, ADF&G estimated the population at 200 to 350 animals (Jones 2012). Packs of wolves were observed along the Kuskokwim River close to Aniak and in the upland areas closer to the mine site during the Donlin Gold Project fall moose surveys (ARCADIS 2013a).



Pipeline

ADF&G has conducted extensive surveys of wolves within the aerial wolf control focus area around McGrath in GMU 19D East, in part to track the efficacy of predator control programs to improve moose populations. Data from these surveys and the other sources of information described for GMU 19A were used to make estimates of 91 wolves in the fall of 2005 (11 wolves per 1,000 mi.²) and 30 wolves in the fall of 2010 after predator control efforts (Seavoy 2012b). However, these estimates do not cover the southwestern part of GMU 19D through which the proposed pipeline would pass. ADF&G estimates that the areas adjacent to the southwestern part of GMU 19D (GMUs 19B and 19C) would likely have wolf densities slightly lower than or equal to the density of wolves in GMU 19D before predator control programs were implemented, about 15 to 20 wolves per 1,000 mi.².

In GMU 16B, wolf control programs have been implemented since 2003 with the management objective of reducing the population to 22 to 45 wolves. ADF&G estimated that the entire GMU 16 had a minimum of 120 to 140 wolves in 1999. Based on local hunter and trapper reports as well as reports from pilots participating in same-day aerial wolf control programs, the population has been reduced substantially as a result of those programs but has stabilized (Peltier 2012b).

3.12.3.1.3 SMALL MAMMALS/FURBEARERS

Some of the species considered in this section are managed by ADF&G as “furbearers” that are trapped or hunted for their hides/fur and in some locations for meat. Trapping provides a source of cash in remote communities, and furs of many species are highly valued for traditional clothing (Perry 2010b). Systematic population surveys are rarely conducted for any species, and population trend information, if available, is derived from infrequent track surveys in fresh snow or trapper questionnaires. Records of the number of animals harvested by trappers each year is a poor index of population trends because the price of furs is variable and the cost of fuel and other aspects of the economy greatly influences the number of people that attempt to trap every year; harvest levels are more indicative of trapper effort than the abundance of different species (Seavoy 2013b).

Trapper questionnaires provide a good sense of the relative abundance of different species if they include experienced, long-term participants in the area, but trap lines are usually in more accessible areas closer to population centers and may not reflect conditions in more remote areas. The lack of population information prohibits ADF&G from assessing the impacts of furbearer management policies on the status of particular species, which also fluctuate due to natural factors such as weather, wildfire impacts on habitat, and prey population cycles. This lack of population information also makes it difficult to track impacts from land development or other changes to the habitat. Table 3.12-5 provides a list of species/groups considered in this section and their relative abundance, if known. These species are very diverse in their natural history and ecological associations, as described in many excellent reference materials, including ADF&G’s website and “Wildlife Notebook Series” (<http://www.adfg.alaska.gov/index.cfm?adfg=animals.listmammals>) and the Alaska Natural Heritage Program website (<http://aknhp.uaa.alaska.edu/maps/biotics/#>). Interested readers are directed to these websites.

Table 3.12-5: Status of Small Mammals and Game Birds in the Project Area

Common Name	Scientific Name	General Habitat	Mine Site (GMU 19A ¹)	Transportation Corridor (GMU 18)	Pipeline Corridor (GMU 19C, 19D, and 16B)
Coyote	<i>Canis latrans</i>	Diverse	Scarce	Scarce	Common to scarce
Red fox	<i>Vulpes vulpes</i>	Diverse	Common	Abundant	Common
Arctic fox	<i>Vulpes lagopus</i>	Tundra/grassland	Not present	Scarce	Not present
Canadian lynx	<i>Lynx canadensis</i>	Forests and shrubs	Common	Abundant	Common to scarce
American marten	<i>Martes americana</i>	Conifer and mixed forests	Common	Common	Common to uncommon
American mink	<i>Mustela vison</i>	Mixed forests	Scarce	Common	Common to scarce
Least weasel	<i>Mustela nivalis</i>	Diverse	Uncommon	Uncommon	Uncommon
Short-tailed weasel	<i>Mustela erminea</i>	Diverse	Common	Common	Common
River otter	<i>Lutra canadensis</i>	Riparian	Common	Common	Common
Wolverine	<i>Gulo gulo</i>	Diverse	Common	Common	Common to scarce
Beaver	<i>Castor canadensis</i>	Wetlands/riparian	Common	Abundant	Common
Muskrat	<i>Ondatra zibethicus</i>	Wetlands	Scarce	Scarce	Scarce
Porcupine	<i>Erethizon dorsatum</i>	Conifer and mixed forests	Common	Scarce	Common
Red squirrel	<i>Tamiasciurus hudsonicus</i>	Forests	Abundant	Common	Abundant
Lemmings, shrews, and voles	<i>Dicrostonyx spp.</i> , <i>Sorex spp.</i> , <i>Microtus spp.</i>	Diverse	Common	Common	Abundant to common
Snowshoe hare	<i>Lepus americanus</i>	Forests and shrubs	Common	Abundant	Common
Alaskan hare	<i>Lepus othus</i>	Rocky slopes and upland tundra	Scarce	Scarce	Scarce
Little brown bat	<i>Myotis lucifugus</i>	Mixed forests and wetlands	Present (Parker et al. 1997)	Present	Present
Ruffed grouse	<i>Bonasa umbellus</i>	Conifer and mixed forests	Common	Absent	Common
Sharp-tailed grouse	<i>Tympanuchus phasianellus</i>	Forests and shrubs	Uncommon	Absent	Uncommon

Table 3.12-5: Status of Small Mammals and Game Birds in the Project Area

Common Name	Scientific Name	General Habitat	Mine Site (GMU 19A ¹)	Transportation Corridor (GMU 18)	Pipeline Corridor (GMU 19C, 19D, and 16B)
Spruce grouse	<i>Dendragapus canadensis</i>	Conifer and mixed forests	Common	Rare	Common
Willow ptarmigan	<i>Lagopus lagopus</i>	Tundra/grassland	Common	Common	Common
Rock ptarmigan	<i>Lagopus mutus</i>	Rocky slopes and upland tundra	Common	Uncommon	Common

Notes:

1 GMU 19A also includes part of the transportation corridor and pipeline corridor.

Source: Relative abundance estimations for furbearers are from trapper questionnaires covering the 2011-2012 period (ADF&G 2013c).

Relative abundance estimates for upland gamebirds are from Status of Grouse, Ptarmigan, and Hare in Alaska (Merizon 2012) and Guide to the Birds of Alaska (Armstrong 1995).

3.12.3.1.4 AMPHIBIANS

The wood frog is the most widely distributed amphibian in Alaska, ranging from the mainland of Southeast Alaska north to the Brooks Range, and is the sole amphibian found north of Prince William Sound (ADF&G 2015g). They inhabit a variety of habitats including mixed forests, open meadows, muskeg, tundra, and even landscaped spaces in urban and suburban areas. Wood frogs are highly terrestrial, and are only found in water during breeding and early development. Although adults can be as long as 3 inches (7.6 cm), they are frequently smaller. This smooth skinned frog may be brown, tan, grey, or green above, with a uniformly cream colored underside. Distinguishing characteristics generally include a prominent dark eye mask and a contrasting light colored lip line running from the snout tip to the rear edge of the mask. Their toes are incompletely webbed.

The wood frog is capable of surviving the frigid Arctic winter because it is one of the most freeze tolerant species on Earth; it has the amazing ability to freeze solid and thaw out as temperatures warm in the spring. Wood frogs hibernate in shallow bowl-shaped depressions under a layer of dead vegetation (duff), with snow cover providing additional insulation.

Wood frogs are reported to breed virtually anywhere that has standing water for at least part of the summer, including ponds, bogs, marshes, temporary pools, tire tracks, or roadside ditches. However, specific studies have shown that the highest breeding activity is in waters from about 1 to 7 feet deep (ABR 2014). The water bodies must remain long enough for the tadpoles to mature and metamorphose. Another important habitat factor is vegetation nearby suitable for hibernating (typically forest vegetation with enough dead leaves and duff covering the ground to form suitable hibernating sites).

The AKNHP has had a citizen volunteer wood frog monitoring project to learn more about and raise awareness of the frogs in Alaska (AKNHP 2015c). Distribution of wood frogs in western Alaska is spotty. They have been studied along the Susitna River (ABR 2014) and were reported at Illiamna Lake (PLP 2011). They have been reported in Bethel, near Red Devil, at McGrath, at

or near Farewell Lake, near Skwentna, and near Tyonek, all in or near the EIS Analysis Area (AKNHP 2015c). None of the Donlin Gold reports mentioned wood frogs being observed during the many biological studies. However, they have reportedly been observed occasionally at the Lyman property about 2 miles north of the proposed open pit (Fernandez 2015).

3.12.3.1.5 PROTECTED SPECIES

There are no terrestrial mammals in the EIS Analysis Area listed as threatened or endangered under ESA. Section 3.14, Threatened and Endangered Species, includes information regarding threatened and endangered species in the EIS Analysis Area.

3.12.3.1.6 CLIMATE CHANGE

Climate change is affecting resources in the EIS Analysis area and trends associated with climate change are projected to continue into the future. Section 3.26 discusses climate change trends and impacts to key resources in the physical and biological environments including atmosphere, water resources, permafrost, and vegetation. Current and future effects on terrestrial mammals and amphibians are tied to changes in physical resources and vegetation (discussed in Section 3.26, Climate Change).

3.12.3.2 ENVIRONMENTAL CONSEQUENCES

Table 3.12-6 indicates the mechanisms by which the effects of the alternatives on terrestrial mammals can be systematically assessed. This table summarizes the criteria for determining the level of impact based on the intensity, duration, extent and context. Table 3.12-7 includes general criteria that can be applied to multiple species.

Table 3.12-6: Impact Criteria for Effects on Terrestrial Mammals

Type of Effect	Impact Component	Effects Summary		
Behavioral Disturbance	Magnitude or Intensity	Low: Changes in behavior due to project activity may not be noticeable; animals remain in the vicinity.	Medium: Noticeable change in behavior due to project activity that may affect reproduction or survival of individuals.	High: Acute or obvious/abrupt change in behavior due to project activity; life functions are disrupted; animal populations are reduced in the EIS Analysis Area.
	Duration	Temporary: Behavior patterns altered infrequently, but not longer than the span of the construction phase and would be expected to return to pre-activity levels after actions causing impacts were to cease.	Long-term: Behavior patterns altered for several years and would return to pre-activity levels long-term (from the end of construction through the life of the mine, and up to 100 years) after actions causing impacts were to cease.	Permanent: Change in behavior patterns would continue even if actions that caused the impacts were to cease; behavior not expected to return to previous patterns.
	Geographic Extent	Local: Impacts limited geographically; limited to vicinity of the Project Area or a subset.	Regional: Affects resources beyond a local area, potentially throughout the EIS Analysis Area.	Extended: Affects resources beyond the region or EIS Analysis Area.

Table 3.12-6: Impact Criteria for Effects on Terrestrial Mammals

Type of Effect	Impact Component	Effects Summary		
Behavioral Disturbance (continued)	Context	Common: Affects usual or ordinary resources in the EIS Analysis Area; resource is not depleted in the locality or protected by legislation.	Important: Affects depleted resources within the locality or region or resources protected by legislation.	Unique: Resources protected by legislation and the portion of the resource affected fills a unique ecosystem role within the locality or region.
Habitat Alterations	Magnitude or Intensity	Low: Changes in resource character or quantity may not be measurable or noticeable.	Medium: Noticeable changes in resource character and quantity.	High: Acute or obvious changes in resource character and quantity.
	Duration	Temporary: Resource would be reduced infrequently but not longer than the span of 1 year and would be expected to return soon to pre-activity levels.	Long-term: Resource would be reduced for up to the life of the Project and would return to pre-activity levels long-term (from the end of construction through the life of the mine, and up to 100 years) after that.	Permanent: Resource would not be anticipated to return to previous character or levels.
	Geographic Extent	Local: Impacts limited geographically; limited to vicinity of the Project Area.	Regional: Affects resources beyond a local area, potentially throughout the EIS Analysis Area.	Extended: Affects resources beyond the region or EIS Analysis Area.
	Context	Common: Affects usual or ordinary resources in the EIS Analysis Area; resource is not depleted in the locality or protected by legislation.	Important: Affects depleted resources within the locality or region or resources protected by legislation.	Unique: Resources protected by legislation and the portion of the resource affected fills a unique ecosystem role within the locality or region.
Injury and Mortality	Magnitude or Intensity	Low: No noticeable incidents of injury or mortality; population level effects not detectable.	Medium: Incidents of injury or mortality are detectable; populations remain within normal variation.	High: Incidents of mortality or injury create population-level effects.
	Duration	Temporary: Events with potential for mortality or injury would occur for a brief, discrete period lasting less than one year, or up to the duration of the construction phase.	Long-term: Events with potential for mortality or injury would continue for up to the life of the project.	Permanent: Potential for mortality or injury would persist after actions that caused the disturbance ceased.
	Geographic Extent	Local: Impacts would be limited to vicinity of the Project Area or subsets.	Regional: Impact would occur beyond a local area, potentially throughout the EIS Analysis Area.	Extended: Impacts would occur beyond the region or EIS Analysis Area.
	Context	Common: Affects usual or ordinary resources in the EIS Analysis Area; resource is not depleted in the locality or protected by legislation.	Important: Affects depleted resources within the locality or region or resources protected by legislation.	Unique: Resources protected by legislation and the portion of the resource affected fills a unique ecosystem role within the locality or region.

Table 3.12-7: Summary of Effects on Terrestrial Mammals from Alternative 2 by Impact Type and Project Component

Impact Type	Impact Level by Factor				
	Magnitude or Intensity	Duration	Geographic Extent	Context	Summary Impact Rating ¹
Mine Site					
Habitat modification	Medium (8,955 acres of habitat loss before reclamation, primarily forest/shrub)	Long-term (areas to be rehabilitated after closure) or permanent (pit lake)	Local	Common habitats in the local area.	Minor to moderate
Invasive species introduction	Low (for plants and Norway rats)	Temporary	Local	Common species	Minor
Behavioral disturbance	Medium to high depending on species sensitivity	Long-term (duration of operations)	Local (extends beyond mine footprint depending on species sensitivity)	Common to important species	Minor to moderate
Barriers to movement	Medium to high (depending on species mobility)	Long-term (areas to be rehabilitated after closure) or permanent (pit lake)	Local (extends beyond mine footprint during operations)	Common to important species	Moderate
Injury and mortality	Low	Temporary (during construction)	Local	Common species	Minor
Increased hunting and trapping pressure	Low (controlled access during operations)	Long-term	Local (near mine access points)	Common to important species	Minor
Contamination	Low (chronic exposure levels)	Long-term (duration of operations) to permanent (pit lake exposure)	Local to regional	Common to important species	Minor
Transportation Facilities					
Habitat modification	Low (873 acres primarily forest/shrub)	Long-term (areas to be rehabilitated after closure) or permanent (port facility and access road)	Local	Common habitats in the local area.	Minor
Invasive species introduction	Low (for plants and Norway rats)	Temporary (IISMP)	Local	Common species	Minor
Behavioral disturbance	High (during construction) and low to medium (operations)	Long-term (duration of operations)	Local (extends beyond road/port footprint during operations)	Common to important species	Minor to moderate

Table 3.12-7: Summary of Effects on Terrestrial Mammals from Alternative 2 by Impact Type and Project Component

Impact Type	Impact Level by Factor				
	Magnitude or Intensity	Duration	Geographic Extent	Context	Summary Impact Rating ¹
Barriers to movement	Low to medium (depending on sensitivity to traffic)	Long-term (duration of operations)	Local (extends beyond road/port footprint during operations)	Common to important species	Minor
Injury and mortality	Low	Temporary (during construction)	Local	Common species	Minor
Increased hunting and trapping pressure	Low (controlled access during operations)	Long-term	Local (near port and access roads)	Common to important species	Minor
Contamination	Low (regulated releases, emergency response procedures)	Long-term (duration of operations)	Local to regional	Common to important species	Minor to moderate
Pipeline					
Habitat modification	Medium (6,000 acres modified and reclaimed, 1,860 acres modified long-term, primarily forest/shrub)	Temporary (during construction) and long-term (during operations)	Regional	Common habitats in different local areas.	Minor to Moderate
Invasive species introduction	Medium (for plants) and low (for Norway rats)	Temporary to long-term (ISMP)	Local to regional	Common species	Minor
Behavioral disturbance	Medium to High (depending on species sensitivity)	Temporary (during construction) to long-term (duration of operations)	Local (extends beyond pipeline corridor depending on species sensitivity)	Common to important species	Minor to Moderate
Barriers to movement	Medium (during construction) to low (during operations)	Temporary (during construction and decommission)	Regional (pipeline corridor)	Common to important species	Minor
Injury and mortality	Low (mobile species) to medium (burrow and denning species)	Temporary (during construction)	Regional (pipeline corridor)	Common species	Minor

Table 3.12-7: Summary of Effects on Terrestrial Mammals from Alternative 2 by Impact Type and Project Component

Impact Type	Impact Level by Factor				
	Magnitude or Intensity	Duration	Geographic Extent	Context	Summary Impact Rating ¹
Increased hunting and trapping pressure	Medium to High (depending on species and improved access)	Long-term or permanent (could extend beyond operations but moderated by adaptive game management)	Regional (pipeline corridor and associated branches of trails/access points)	Common to important species	Minor to moderate
Contamination	Low (small, during construction, emergency response procedures)	Temporary (during construction and decommission)	Local to regional	Common to important species	Minor

Notes:

- 1 The summary impact rating accounts for impact reducing design features proposed by Donlin Gold and Standard Permit Conditions and BMPs that would be required. It does not account for additional mitigation measures the Corps is considering.

3.12.3.2.1 ALTERNATIVE 1 – NO ACTION

Under the No Action Alternative, minor impacts to terrestrial mammals would continue from ongoing mineral exploration and from reclamation of existing exploration and related disturbance (camp, roads, and airstrip).

3.12.3.2.2 ALTERNATIVE 2 – DONLIN GOLD'S PROPOSED ACTION

Potential Impacts

There are several different types of direct and indirect effects from the Donlin Gold Project that could be expected to impact essentially all terrestrial mammal species and amphibians to various extents; habitat changes associated with removal or modification of vegetation in a given area, habitat fragmentation, behavioral disturbance, exposure to potentially toxic materials, the potential for injury and mortality, and the potential for accidental fires that affect habitat. These types of impacts are also potentially subject to modification by climate change. These types of effects are common to all three major components of the project, i.e., mine site, transportation facilities, and natural gas pipeline, although there are certainly differences among the project components in their intensity and the species they may affect. The following is a general discussion of these common effects which serves as background for more specific analyses under the major project components and phases.

Habitat Loss and Modification

Different vegetation types provide the basis for essential habitat functions for all terrestrial mammals and amphibians. Some aspects of the proposed Donlin Gold Project, such as the mine pit, would result in permanent changes to habitat value for all species, while others, such as the pipeline corridor, would involve removal of vegetation during the construction phase, revegetation, and a gradual regrowth of native plant communities except in areas subject to regular maintenance brushing during the operations phase and areas with permanent changes in hydrology. Localized areas may also experience vegetation changes related to changes in hydrology due to embankments or new drainage areas (See Section 3.10, Vegetation, and 3.11, Wetlands). Areas that are not permanently altered would likely be used by a variety of terrestrial mammals for different habitat functions as the revegetation/succession process continues. For some species such as moose, snowshoe hares, and voles, clearing of forested areas and early successional regrowth can improve the habitat value of an area; especially if the disturbed areas are narrow (e.g., the pipeline corridor) and surrounding forests remain to provide cover. The relative importance of habitat modifications therefore varies over time and this timeline for adverse or beneficial changes is different for different species.

The direct loss of different vegetation types due to all construction phase activities has been quantified (Section 3.10, Vegetation) using the mine site plan and typical construction methods for the natural gas pipeline from Beluga. These data include vegetation cleared or disturbed for construction camps, airstrips, material storage yards, quarries or gravel pits, barge landing sites, construction access roads, or other facilities associated with project construction. According to the Donlin Gold Reclamation and Closure Plan, reclamation of areas outside the long-term footprint of the project would begin immediately after construction and stabilization. Reclamation would include grading to recontour as needed, distribution of slash and chipped vegetation, and fertilizing and reseeding as required. Seeding of the disturbed areas would be done in consultation with BLM and ADNR and follow methods and Best Management Protocols (BMPs) described in the Revegetation Manual for Alaska (Wright 2008), Alaska Coastal Revegetation & Erosion Control Guide (Wright and Czapla 2011), or the Interior Alaska Revegetation and Erosion Guide (Czapla and Wright 2012). Temporary construction areas would be revegetated within a few years. Some areas such as the pipeline corridor and shoulders of long-term access roads would be maintained in early successional stages by brushing during the operations phase, but other areas would be allowed to revegetate through natural succession. Most of the vegetation that would be removed consists of boreal forest tree species (white spruce [*Picea glauca*] or black spruce, quaking aspen [*Populus tremuloides*], and paper birch [*Betula papyrifera*]), shrubs (alders [*Alnus* spp.], willows, salmonberry [*Rubus spectabilis*], lingonberry, cranberry, and blueberry [*Vaccinium* spp.]), and ground cover species (herbaceous plants, sedges, and grasses). For places that would be revegetated after construction, such as the pipeline corridor and construction support sites, revegetation efforts would focus on fast-growing ground cover to minimize erosion in the first year but shrub and tree species would likely re-colonize many disturbed areas within a few years. Other areas would not be revegetated until the closure phase, which would be a long-term habitat effect, and the pit lake would preclude vegetation, resulting in a permanent change. Further details of vegetation effects and revegetation are in Section 3.10, Vegetation. This direct loss or modification of habitat, while substantial, is relatively small compared to the amount of similar, common natural habitats within the Project Area.

Habitat value for wildlife may also change as a result of the accidental or intentional introductions of all taxa of invasive species that could potentially change the composition, structure, or function of terrestrial or aquatic vegetation communities. A number of invasive plant species have been identified within the Project Area, as documented in the Alaska Exotic Plants Information Clearinghouse and EIS Analysis Area surveys (AKEPIC 2015; Moody 2013, 2015). Donlin Gold would develop an Invasive Species Management Plan (ISMP) to reduce or eliminate the spread of invasive species throughout the Project Area. The ISMP would be developed in conjunction with the Stabilization, Rehabilitation and Reclamation Plan; the plan is described in detail in Section 3.10, Vegetation. Compliance with BMPs would minimize the risk of introducing invasive species to the Project Area and thus minimize the chance of reducing wildlife habitat values.

Norway rats are an invasive terrestrial mammal species that has colonized numerous cities and islands in Alaska, including Dutch Harbor, Nome, and Fairbanks (ADF&G 2015c). Rats can have a variety of adverse effects on the ecosystem and other terrestrial mammals, including competition for a wide range of food resources and the potential to spread parasites and diseases. Rats have had devastating effects on some islands, primarily by eating seabirds and disrupting their nesting efforts, but also by changing vegetation patterns and the presence of other predators (AMNWR 2007). Invasions of rats have typically occurred when rats living on marine vessels have escaped while the vessel was in port, or during shipwrecks. The potential for invasions of rats from barges and other vessels has existed for many years; however, if any have reached shore in Bethel or any other community along the Kuskokwim River, they have apparently not persisted or established known colonies. This may be the result of typical invasion barriers which include a combination of biological factors (e.g., predation by domestic and wild predators), physical factors (e.g., widely distributed small communities that reduce the availability of suitable habitats) and simple luck or lack of sufficient repeated introductions. The increase in barge traffic along the Kuskokwim River in any of the action alternatives may increase the risk of rat invasions. Under Alaska law (5 AAC 92.141), it is illegal for any property owner or vessel operator to knowingly transport Muridae rodents (including Norway rats) into Alaska and it is the responsibility of the property or vessel owner to develop and implement ongoing rodent control and eradication plans if any such rodents are discovered. Donlin Gold would therefore be responsible for ensuring that vessels used during their operations were rat free and to continually monitor and protect against any such invasions. Norway rat prevention practices, monitoring, and control measures would be included in the ISMP, described in detail in Section 3.10, Vegetation.

Another mechanism for habitat loss and modification involves behavioral responses of animals to noise or visual disturbances. Behavioral responses to disturbance can range from mild “alert” behavior to fleeing at top speed, depending on disturbance type, distance, species, season, and many other variables. In some cases, disturbance from human noise and activity during construction and operations of project components could cause terrestrial mammals to avoid the disturbance. Noise itself may not affect amphibians, although vibration might. The size of this “avoidance zone” would depend on the type and intensity of the disturbance as well as on many animal behavior variables. Some species, like moose and squirrels, appear to habituate to traffic and human habitations while others such as wolves and brown bears do not. Some facilities may also be more readily habituated to than others. For example, facilities like the pipeline compressor station or the water treatment plant are more predictable and stay the same for long periods, thus have lower effects on wildlife than moving or more erratic sources. The

effective loss of habitat for each species would therefore fluctuate over time but could be substantially larger than the cut and fill limits of the construction zone for some species.

Behavioral avoidance of the mine site, vehicles on access roads, barges on the Kuskokwim River, and active construction zones may function as a partial barrier to movement for some species or for particular sex and age-classes within species. In other cases, physical features of the mine facilities development, such as steep cutbanks, holding ponds, material yards, or retaining walls may prevent or limit animal movements through the area. This would be a long-term effect at the mine site due to the projected size and nature of the physical alterations to the site, but would likely be limited to the construction phase along the pipeline corridor. Project-related disturbance along the Kuskokwim River would be seasonal so impacts on habitat use would primarily occur in the open water months.

For species that have large home ranges or that travel seasonally between winter and summer ranges, such as bears, wolves, caribou, and Dall sheep, the introduction of a barrier to movement could serve to fragment and decrease the size of their preferred habitat. Brown bears tend to avoid construction activities and road traffic much more than black bears. One study found that brown bears avoided roads regardless of traffic volume (McLellan and Shackleton 1988). This means that they could be more likely than black bears to abandon certain parts of their range rather than cross access roads or mine facilities. Wolves travel widely in pursuit of prey and thus use a variety of habitat types. Direct loss of habitat due to the mine facilities may therefore be relatively unimportant for wolves. However, wolves strongly avoid roadways and other areas with high levels of human activity (US Forest Service 2000, Person 2001) and thus may have a large avoidance zone around the mine and access road that could disrupt their normal travel patterns and foraging success.

The expansion of human habitations and transportation corridors may also attract some species. Black bears, brown bears, foxes, and ground squirrels are known to be attracted to construction camps and other human habitations because of food and garbage if it is not carefully managed. Donlin Gold would develop a Wildlife Avoidance and Human Encounter/Interaction Plan to minimize the attractiveness of camps and other facilities and minimize the risk of adverse human/animal interactions. In addition, some species such as moose may be attracted to roadways and disturbed areas because of vegetation planted for erosion control, to avoid predators or deep snow, or as a movement corridor (US Forest Service 2000; Trombulak and Frissell 2000).

Potential Injury and Mortality

As described above, behavioral disturbance can affect the ability of animals to use certain habitats. If animals are forced out of their familiar territories or have to alter their movement patterns, they may enter the territories of other individuals that defend them aggressively, with the potential for injury or mortality. They may also be more susceptible to predation through lack of experience with local cover and escape terrain. In extreme cases, disturbance can actually lead to mortality of the animal if it causes a mother to be separated from or abandon her young or if the animal is injured trying to flee.

Moose often feed near roads even when vehicles are present and rest or travel along cleared roads during heavy snow conditions. They frequently cross roads even when vehicles are present, but they are often startled by traffic and bolt to one side or the other. This may cause cows to be temporarily separated from their calves and increases their risk of injury or mortality

through vehicle collisions when the animals try to reunite. Although construction vehicles typically travel at relatively slow speeds that would reduce the risk of collisions, the potential for injury and mortality would exist during the construction and operations phases of the mine site and pipeline, especially at night or other periods of poor visibility and in the winter when animals may use the mine access road to escape deep snow. Donlin Gold proposes to control traffic on access roads for project-only purposes and to enforce slow speed limits (i.e., 35 miles per hour). While traffic controls would be implemented through signage and security patrols, there are too many variables to know how effective they might be in reducing the risk of vehicle collisions with animals. Other species may also cross roads and have the potential for injury and mortality due to collisions with project vehicles, including caribou and a variety of small mammals.

Vegetation clearing for all aspects of the project would likely take place outside of the nesting seasons as defined by the FWS' Land Clearing Timing Guidance for Alaska (FWS 2009) to minimize impacts on birds. This construction window would also likely benefit terrestrial mammals by minimizing habitat disturbances in the spring and early summer when young of most species may be more susceptible to disturbance. However, some terrestrial mammals, such as bears, wolves, river otters, and marten, give birth in dens during the winter or early spring. Land clearing and other construction activities near den sites during these months could cause some direct mortality of adults and young if dens are inadvertently destroyed, with the potential for decreased reproductive success. Since bears tend to choose den sites at higher elevations than the mine site or pipeline corridor, the potential for disturbance of denning is much smaller for bears than it is for otters or marten. Other small mammals such as voles and shrews live under the snow in burrows but have limited capacities to move away from construction equipment during the winter. They may have to leave their burrows to flee from clearing activities and would then be much more susceptible to predators and cold temperatures.

Black bears and brown bears can be attracted to human garbage and food supplies, which often brings them into conflict with humans and results in bears being shot in defense of life or property. This is often a problem for remote construction camps (McLellan 1989). Donlin Gold intends to conduct site-specific orientation for all employees and contractors to include briefings on wildlife interactions, including bear safety, and would institute wildlife interaction plans that include proper management of food waste in order to address this issue.

Another potential indirect effect of the Donlin Gold mine development common to all phases of the project is the possibility of increased hunting and trapping pressure on the area's wildlife. This could arise due to two main factors: 1) improved public access to previously difficult-to-reach areas along construction roads and the natural gas pipeline corridor, and 2) the influx of workers and new residents attracted to the employment opportunities of the mine. Donlin Gold intends to prohibit public access to the mine access road and mine camp airstrip, so the main project component where improved public access could lead to increased hunting pressure is along the natural gas pipeline corridor. This type of effect on terrestrial mammals is discussed in the Natural Gas Pipeline, construction phase section below. Potential increases in hunting pressure from mine-related workers could apply in all three of the project components and is discussed here.

New mine employees and associated contractors would likely be well paid and could afford off-road vehicles, river boats, airplanes, and guide services to hunt on their off-duty hours. Donlin

Gold intends to implement restrictions on the possession and use of firearms and other weapons at their construction and operations camps and would prohibit their personnel from hunting, trapping, and fishing while they are working. These restrictions could minimize the impact of additional hunting and trapping pressure in the immediate vicinity of the camps and mine facilities. However, Donlin Gold would need to hire thousands of people to work during the construction phase and hundreds to operate the mine and transportation system, many of which would not already be local residents. Some of these people could choose to live in nearby communities such as Bethel rather than traveling long distances when they are off-shift. This increase in the local human population, and the potential for improved motorized access for current residents that are employed by the mine, could lead to increased hunting pressure for recreational and subsistence purposes, especially for popular big game species such as moose and caribou. It could also lead to increased trapping pressure on furbearers. The increased demand for wildlife resources could lead to changes in wildlife management policies to address this demand, including the potential for expanded predator control programs on state-managed lands that could affect the populations of wolves and both species of bears. Considering the relatively low populations of moose and caribou, the influx of new people and increased mobility could lead to increases in hunting and trapping pressure that could reduce local game populations and necessitate changes in wildlife management regulations.

Contamination and Fuel Spills

Another issue that is common to all species and project components is the potential for terrestrial mammals to be exposed to fuel spills from construction vehicles or fuel supply operations of the mine and exposure to toxic material or water related to the mine. These aspects of the project construction and operations phases would be subject to a great deal of regulatory oversight, specialized equipment such as double-hulled fuel barges, and mandatory mitigation measures.

Section 3.24, Spill Risk, provides an analysis of the risks of spills from fuel barges and storage tanks along the Kuskokwim River, fuel tankers and other vehicles along the mine access road, and construction vehicles used throughout the Project Area. The risk of catastrophic accidents is very small, meaning they would occur rarely if at all, during the life of the project. However, the likelihood of small-scale exposure to contamination is greater and could occur in various locations. The severity of impacts to terrestrial mammals would depend on the type of exposure, the volume and duration, the location and season of the exposure, and many variables related to the presence of animals and their behavior.

For example, exposure to contaminated water or dust from mining operations could have adverse impacts on wildlife near the mine site, resulting in potential exposure of terrestrial mammals to toxic substances. Discussion on this topic is included in the mine operations section below.

Climate Change Summary for Alternative 2

Predicted overall increases in temperatures and precipitation and changes in the patterns of their distribution (McGuire 2015; Chapin et al. 2006, 2010; Walsh et al. 2005) have the potential to influence the projected effects of the Donlin Gold Project on vegetation and wetlands and likewise on wildlife habitat. An overall warming/drying trend would tend to convert some wetlands to uplands and tend to increase the cover of shrubs and trees in previously open areas.

Warming may also increase the thawing of permafrost over time. In project areas like the pipeline, increased thawing might lead to more open water areas. A combination of more open water and more nearby upland or forested areas may benefit species like the wood frog and waterfowl. An increase of fires due to drying might benefit species like bison and possibly caribou that use early successional habitat areas, but be a detriment to species that rely on forested cover. It is hard to predict how habitat important for moose would be affected. See Section 3.26 (Climate Change) for further details on climate change and resources.

Direct and Indirect Impacts

Mine Site

Construction

Construction phase activities associated with the mine site include vegetation clearing for the mine facilities, including waste rock and tailings storage areas. The areas of vegetation types expected to be lost to these clearing efforts are shown in Table 3.10-8 in Section 3.10, Vegetation. Coniferous forest and shrub habitats predominate. Essentially all of the terrestrial mammal species occurring in the mine site area use these vegetation types for food, shelter, and other life functions at least part of the year. However, these types of habitats are common and extensive in this part of Alaska and are not considered unique for any species; the amount of habitat lost from clearing at the mine site would be relatively small by comparison and considered minor for all terrestrial mammals.

Indirect habitat loss would occur due to behavioral disturbance of animals from blasting and noise from heavy machinery used to remove waste rock and construct the mine facilities. It is likely that all mammals would leave the immediate area if they could and stay various distances away from the construction zones in order to avoid the loud, continuous sounds, periodic percussive sounds, and presence of people and machinery that would disrupt their normal behaviors. The distance of this avoidance zone would depend on many variables but would add to the effective loss of habitat for every species. Species that do not usually habituate to human presence or tolerate loud sounds, such as brown bears and wolves, could avoid the area by substantial distances and may thus have large effective losses of habitat near the mine site. In addition, the avoidance of construction activity could cause animals to travel long distances around the mine to reach preferred habitats, causing habitat fragmentation or abandonment of previously valuable habitats, which could reduce survival and reproductive success for some individuals.

Blasting and massive removal of waste rock during construction of the mine could cause injury and mortality to small mammals and amphibians that have limited abilities to move away or avoid heavy machinery. There is also the potential for injury or mortality from flying or falling rocks during blasting activities, although most animals would have moved away prior to blasting as a result of human presence and noise from machinery. Large mammals would likely abandon the area before blasting occurred but pre-blasting safety checks could presumably detect any large mammals that enter the safety zone and they could be herded out of harm's way.

Operations and Maintenance

Disturbance of terrestrial mammals would continue to be chronic and periodically intense throughout the operations of the proposed mine, and the disturbance zone would expand in geographic extent as the mine grows to its maximum size. The Angyaruaq (Jungjuk) Port site would also be a source of chronic, localized disturbance due to barge traffic, loading and unloading activities, and the physical presence of people and vehicles. The disturbance zone around the port site would likely be much smaller than the area around the mine site because of the lack of explosives and smaller vehicles. Living facilities at the mine and port sites would be subject to wildlife interaction plans to minimize the risk of attracting bears and other potentially adverse interactions with humans. Traffic on the mine access road during the operations phase would be subject to speed restrictions, which would reduce the risk of injury or mortality from collisions with animals, but would also be a chronic, localized source of disturbance. Disturbance at the Angyaruaq (Jungjuk) Port site and along the mine access road would be concentrated during the open water season when barge traffic was present, with greatly reduced levels of human activity in the ice-up season.

The streamlined ERAs presented in Section 3.12.2.1.2 address potential risks to wildlife from exposure to metals in water at the TSF and at CWD Ponds during operations of the mine. Concentrations of evaluated chemicals did not present risk under chronic exposure scenarios, and therefore, also are not expected to present any risk under acute scenarios. In addition, the evaluation of dust effects in Section 3.12.2.2 concludes that the deposition of particulates on surface soil surrounding mine operations is not expected to pose a risk to terrestrial organisms different from the risk from baseline concentrations.

Closure, Reclamation, and Monitoring

The mine site would be subject to periodic monitoring activities during the closure phase, which would likely involve small numbers of people and vehicles for relatively brief periods of time. The potential disturbance of animals from these activities would be minimal and temporary in nature. With re-vegetation and natural succession causing continual changes in the vegetation of the mine site, other than the mine pit, the value of the mine site as habitat for terrestrial mammals would likely improve and change over time. Moose and other mammals that prefer early successional vegetation are likely to return to the mine site after human activity is curtailed. As trees grow back, arboreal species such as squirrels and martens could also return. As the herbivore species return, predators such as brown bears and wolves could also start using the mine site area again. The closure phase could therefore include a gradual return to a state similar to the pre-mine construction phase although the pit lake would constitute a permanent removal of some habitat for terrestrial mammals and could hinder movement for some species. The potential effects of the mine site after closure would therefore be permanent, localized, and small in magnitude for all terrestrial mammals.

Summary of Ecological Risk Assessment for the ACMA Pit Lake

As described in Section 3.12.2.1, Attraction to Mine Site Open Water Areas – Ecological Risk Assessment, an ERA of the proposed future ACMA pit lake was prepared to evaluate the potential for risk to terrestrial ecological receptors exposed to water accumulated in the open pit after mining is completed and water is allowed to accumulate in the open pit. The summary below is from the ERA:

For the pit filling scenario, HQs were much less than 1 for all receptor-COPC combinations, indicating risk is unlikely to wildlife exposed to the proposed pit lake during development. In the mature pit lake scenario, selenium HQ_{NOAELS} were less than or equal to 1 for all receptors, while for antimony and arsenic, HQ_{NOAELS} were less than or equal to 1 for most receptors, but greater 1 and less than 10 for a few receptors. All HQ_{LOAELS} for antimony, arsenic and selenium were less than 1 for all receptors. These results indicate that risk to wildlife from exposure to COPCs associated with the Donlin pit lake is not confirmed. In these cases, a review of assumptions and uncertainties is conducted to help guide further interpretation of results.

There are a number of conservative assumptions inherent in the ERA, including the use of maximum COPC concentrations in surface water and sediment, estimates of receptor exposure durations, conservative assumptions regarding littoral and riparian development and dietary fractions of pit lake items, and 100 percent bioavailability of ingested sediments and food. These assumptions contributed to overestimates of exposure and risk in the ERA.

However, even with the highly conservative assumptions used for risk characterization of the mature pit lake, all HQ_{LOAELS} were less than 1 for the receptors, and HQ_{NOAELS} were above 1, but less than 10, for a few receptors. Thus the conclusion of this ERA is that chemical risk is unlikely to wildlife from exposure to predicted chemical concentrations in the proposed Donlin pit lake.

An ERA Addendum (ERM 2015) was conducted to re-evaluate aluminum and copper in the mature stage pit lake. The following summary is provided from the ERA Addendum:

All upper bound HQs (i.e., LOAEL-HQs) [for aluminum and copper] are less than 1, indicating no adverse effects to wildlife receptors are predicted. Two lower bound HQs (NOAEL-HQs) were slightly greater than 1 for the mallard duck and tundra vole risk characterization of aluminum, indicating some uncertainty exists in no effect predictions for these receptors' exposure to aluminum. Upper bound HQs were less than 1 for these receptors, however, indicating no prediction of adverse risk to mallards or voles. The ERA was designed to be a conservative prediction of potential risk; as such, many assumptions were built into the ERA that assume greater exposure of wildlife receptors than are likely to be the case. The reason for incorporating conservative assumptions is to increase confidence that the risk predictions are not underpredicting risk to wildlife. Even with the inherently conservative predictions, upper bound HQs are all less than 1, and lower bound HQs were only slightly greater than 1. Thus, the potential risk to wildlife from exposure to aluminum and copper concentrations in the proposed pit lake is regarded as low.

Transportation Facilities

Construction

Construction of the Angyaruaq (Jungjuk) Port and storage facilities in Bethel would impact a small amount of terrestrial mammal habitat and cause disturbance of mammals in those local areas. The loss of habitat to these facilities would be very small in magnitude relative to the amount of similar habitat available in the area, although the loss would be long-term. Behavioral disturbance would likely be greater during the construction phase than during the

operations phase but the number of animals affected would probably be small during either phase given the limited area affected.

Barges and other vessel traffic used during the construction phase could also disturb terrestrial mammals using riparian habitats along the Kuskokwim River. The frequency of river vessel traffic needed to support the construction of the port facilities, mine facilities, and natural gas pipeline would be substantially greater than (nearly double) the baseline conditions (Section 2.3.2.2, Chapter 2, Alternatives).

Local residents along the Kuskokwim River have testified at scoping and other meetings (URS 2014e) for the Donlin Gold Project that existing barge traffic affects large terrestrial mammals, such as moose, along the riverbank through a combination of noise and visual disturbance. Residents have observed moose coming out into the open and crossing the river only after existing barge traffic has passed and the sounds and wakes have abated, a period which may last tens of minutes or more depending on the barge load and direction of travel. This cautionary avoidance of the river bank and crossing the river may extend to other species such as bears and caribou. In combination with existing river traffic, the increased frequency of disturbance due to barge and other vessel traffic during the construction phase could deter animals from using habitats and moving between different parts of their range during the open water season. This effect may be more pronounced in high traffic areas (e.g., around Bethel and the Angyaruaq (Jungjuk) Port site). This disturbance-related loss of habitat could have adverse effects on the animals, although it may also make it more difficult for them to be hunted from the river, which would benefit the animals even though it would be an adverse effect for subsistence or recreational hunters.

Riparian wildlife habitat could also be modified by erosion of the river bank due to barge wakes. The banks of the Kuskokwim River include many silty soil types that are susceptible to erosion. The river bank is a naturally dynamic environment, with water currents, wind-generated waves, and ice scouring all causing changing areas of erosion and deposition. Large wakes generated by current barge and small boat traffic have contributed to these natural processes that undercut and cause collapse of vegetated banks into the river. Measurements of erosion rates at different parts of the river from 1988 to 2006 indicate that average erosion rates of all wetland types, including the contribution from existing vessel traffic, are much higher in the lower sections of the Kuskokwim River (9.07 acres per year from the mouth to Bethel) and progressively decrease upriver (1.79 acres per year at Tuluksak, 0.45 acres per year at Kalskag, and 0.17 acres per year from Aniak to Napaimute) (see Section 3.11.4.2.2, Wetlands). New barge traffic related to mine development would contribute incrementally to erosion rates on the river bank and would therefore contribute to riparian habitat modification. However, the projected increase in erosion rates due to mine-related river traffic is very small, with an estimated increase over current rates ranging from 0.21 acres per year downriver to 0.01 acres per year upriver. Erosion of riparian habitat may be an adverse effect for some species and beneficial for other species that prefer disturbed landscapes with early successional plants.

Construction of the mine access road would involve land clearing along the ROW and any gravel pits needed for construction. This direct loss of habitat is estimated to involve approximately 873 acres of primarily coniferous forest and shrub habitat (see Table 3.10-9, in Section 3.10, Vegetation). This impact would be long-term but would be relatively small in magnitude given the prevalence of similar habitat in the area. Disturbance from land-clearing and construction equipment would likely displace and deter most terrestrial mammals from

using nearby areas during active construction, thus increasing the effective loss of habitat. Land clearing would likely occur during the winter season and road construction would likely occur primarily during the non-winter months. Disturbance along the mine access road corridor would therefore extend throughout the year during the construction phase, although it would not impact the entire ROW at the same time.

Construction of the mine access road would probably last one or two years at the beginning of the construction phase. Mine development traffic along the road would likely begin soon after it was completed. Such traffic could be substantial in terms of the number and frequency of vehicles on the road as mine equipment and construction materials are delivered to the Angyaruaq (Jungjuk) Port site and transported on the road. Given speed restrictions and the noise of heavy equipment moving along the road, the risk of injury or mortality due to collisions with wildlife on the road would be low, but disturbance would be almost continual near the road (up to a few hundred yards for some species).

Operations and Maintenance

Donlin Gold estimates that operations of the mine site would require an average of a little more than one barge per day (122 in 110 days) to haul fuel and material on the Kuskokwim River between Bethel and the Angyaruaq (Jungjuk) Port site each day during the open water months. This level of activity would be similar to the frequency of river barges used during the construction phase and would entail all of the same types of effects on terrestrial mammals as described above. This transportation schedule would apply to the entire lifespan of the mine and would therefore have long-term direct and indirect effects. There is the potential for some large animals to habituate to the noise and increased presence of barge traffic over time, which would tend to reduce the magnitude of effects related to disturbance. However, animals like moose are unlikely to change their patterns of crossing the river in response to barges, and the increased frequency of barges will leave less time free for crossing during the shipping season.

Transportation of fuel, materials, and camp supplies along the mine access road would involve a relatively small number of vehicles (about 20), each making 2 to 3 round trips of 3.25 hours each per day during shipping season throughout the operations phase. The expected frequency of traffic would be equivalent to one truck passing any given point on average every 5 to 10 minutes during a 10-hour period each day during the shipping season. The risk of injury and mortality from collisions with vehicles would increase during twilight hours or if the trucking extends into the winter when daylight is limited, snow restricts visibility, and icy roads increase stopping times for trucks. If trucking occurs only during the shipping season, twilight or night driving hazards would be reduced. Donlin Gold intends to prohibit public use of the access road for safety reasons, including use by local residents. Traditional use of the surrounding area for subsistence hunting, trapping, and berry picking could be inhibited potentially resulting in localized increases in game species and furbearer populations through reduced hunting and trapping pressure. However, access to these areas by traditional means and routes may not be affected unless the access requires crossing mine-restricted property.

Closure, Reclamation, and Monitoring

The Angyaruaq (Jungjuk) Port site and all mine support facilities would be removed after closure and the land would be re-contoured and reclaimed. The mine access road and mine camp airstrip would remain in place during the closure phase to support reclamation and monitoring activities at the mine site. Some supplies and fuel may need to be barged up to a

landing at Angyaruaq (Jungjuk), but the main port facilities will be removed, and this would be just another barge stop much like existing village stops. The volume of materials moved would be a tiny fraction of the operational volume and would be similar to the baseline conditions. The types of effects associated with the road and traffic, including behavioral disturbance, habitat fragmentation, and potential for injury and mortality, would continue but would be greatly reduced in magnitude after closure due to the very low traffic. Effects would be localized, and small in magnitude compared to the operations phase effects.

It is not clear how access to the Angyaruaq (Jungjuk) access road would be closed to the public after the mine is closed. Because there are currently few roads in the area it is likely that local residents may want to use the port and road to access subsistence resources, especially those who worked at the mine or port and have become knowledgeable about the area and live nearby. This increase in access, should it occur, could increase hunting and trapping pressure in the Angyaruaq (Jungjuk) area (depending on wildlife populations), although it may reduce hunting and trapping efforts elsewhere as people choose to go where access is easiest. After the mine is closed, some of the people who moved to the area for work may seek to move elsewhere for new employment, thereby reducing the number of local residents trying to use wildlife resources. However, local communities like Bethel may retain more residents than under the status quo as a result of long-term employment at the mine and establishment of families within the communities.

Natural Gas Pipeline

Construction

The construction of the proposed natural gas pipeline would impact a 315-mile long but narrow swath of wildlife habitat from the mine site to Cook Inlet plus numerous road segments through which materials and personnel would access the construction site, staging areas for construction supplies, airstrips and helipads, construction camps, and material pits for construction gravel. The construction ROW would impact 6,000 acres of land, including about 2,400 acres of shrub vegetation and 3,265 acres of forest habitats (see Table 3.10-10, in Section 3.10, Vegetation). This direct loss/modification of habitat is relatively small compared to the amount of similar habitat along the pipeline route (see Table 3.10-11, in Section 3.10, Vegetation), but the decreased use of nearby habitat due to disturbance from noise and the physical presence of construction vehicles and people would likely be much larger than the direct loss/modification of habitat.

The pipeline would be constructed in segments (spreads) over 2-1/2 years, so the entire length of the pipeline corridor would not be impacted by construction activities at the same time. However, the construction spreads and support facilities would likely cause high magnitude disturbance for most terrestrial mammals for several miles along the construction zone at any one time. Most animals would likely avoid the disturbance by leaving the area if they could, although some species of small mammals are limited in how far they can travel. The combination sequence of open trench, pipeline laid out on the ground, lines of construction equipment, and construction camp facilities could be very effective localized barriers to wildlife movement primarily for small species with limited mobility in relation to all animal terrestrial species potentially affected. Although such barriers may only last a few weeks in any given location, construction traffic to and from the active work site will extend the disturbance. Species such as moose, caribou, sheep, and bison have seasonal movement patterns between

different preferred habitats that could be disrupted, leading to reduced foraging success, survival, or reproductive success.

Moose tend to move between higher elevations in the summer and lower elevations in the winter and bull moose move extensively during the rut in fall (September and October) as they search for estrous cows. Caribou move between calving grounds (May-June), insect relief areas (June-July), and seasonal foraging areas (fall and winter months). Bison move between their summer range in the foothills near the South Fork and Windy Fork of the Kuskokwim River, including the physiologically important mineral licks in the Farewell area, and their winter habitat north of the proposed pipeline in the Bear Creek Burn area. However, the seasonal ranges of the bison overlap and animals could occur along the pipeline corridor at all times of year. Dall sheep also move down from their alpine habitats to use the Farewell mineral licks during the summer and fall. The potential for disruption of these movement patterns and the associated impacts to vital life functions are of particular concern to local residents and others, as expressed during the EIS scoping period. The potential for disturbance of these important game species along the pipeline corridor appears to be of particular concern in the Alaska Range and foothills to the north of the mountains given their important habitat values for all of these species.

There is the potential to mitigate or minimize these types of disturbance effects through advanced planning of construction schedules and activities to avoid the most sensitive areas and times. However, there are logistical constraints in moving construction camps and equipment so the potential for adaptive management to avoid impacts to real-time animal movements through rapid changes in construction activities is limited.

The pipeline construction schedule (see Table 2.3-30 in Chapter 2, Alternatives) shows segments to be constructed over two summers and two winters in two different spreads. The logistics of getting the materials and equipment in place and facilitating construction crew support for those different segments, however, means that some segments have construction activities over a longer period than when the actual pipeline construction occurs. For example, section 2 and section 4 of the pipeline are to be constructed in the second winter, but sections 3A, 3B, and 3C get constructed before sections 2 and 4. That means that the access road through sections 2 and 4 will have to be functional during the first winter as well as the second winter, and where shoofly roads are required to get around places that are too steep, those will have to be built to accommodate trucks delivering pipe ahead of a summer construction season in section 3A or 3B. Camps and airstrips will need to be constructed ahead of when they are needed, and this will require that material sites be used. Clearing of trees in the ROW would typically be done during the fall or winter preceding construction of the construction roads in any given area. Winter construction sections 1 and 5 will also be active for both winters, because they are vital transportation links for equipment and supplies for the other sections. The stretch of pipeline corridor from the Kuskokwim River crossing at mile post 240.4 to the crossing of the South Fork of the Kuskokwim River at MP 144.4 will be quite busy for two winters. The same would be true for the section between the Skwentna River (MP 50.8) and Puntilla Lake (MP 101.8).

The proposed construction schedule for Alternative 2 shows the northern part of the route through the Alaska Range (approximately MP 110 to MP 145) would be completed from May through August. Dall sheep would be having their lambs in May and June but would typically be at much higher elevations than the construction equipment. Movements of sheep across the valley could be inhibited in areas of active construction, although the effects would be short-

term (days or a few weeks) in any one area. Caribou from the Rainy Pass herd could also be in the area at this time, although they typically range further to the west, and would likely avoid the active construction zone. Construction activity at the northern end of this section could inhibit or redirect some movements of bison and sheep near the Farewell mineral lick area.

The proposed construction schedule shows the segment along the northern foothills (approximately MP 145 to MP 195) would be actively worked from November through April. Most of the moose, caribou, and bison in the area would likely be further north in the lowlands during this period, although there could be areas with higher concentrations of these species along the corridor in protected river/creek valleys. Use of the Farewell mineral lick area would likely be minimal at this time of year due to snow cover.

In addition to inhibiting normal movement patterns, high levels of disturbance could have effects that range from physiological reactions to stress, potential for injury and mortality from exposure to predators and sub-optimal habitats, injury and mortality for denning mammals and small mammals in subnivean spaces during winter construction, and reduced survivability and/or reproductive success in unfamiliar territories. Some species are particularly sensitive at certain times of year (i.e., Dall sheep lambing in spring, bear and wolf denning in winter, and moose rutting in fall). Ground-based activities would be the primary concern for most species, but airplane and helicopter traffic could also be problematic for certain species. Dall sheep and caribou are known to react strongly to low-flying aircraft, although minimum flight altitude restrictions (> 1,000 feet) are often required on resource development projects and may be an effective mitigation measure.

Donlin Gold would develop a Wildlife Avoidance and Human Encounter/Interaction Plan to minimize the risk of adverse wildlife interactions with pipeline construction workers. These types of plans for large construction projects in Alaska generally include bear safety training programs for workers, bear guards for construction crews and camps where necessary, waste management plans and facilities to minimize attractants to wildlife in camp, prohibitions against feeding or harassing wildlife, and communication protocols to frequently remind workers of wildlife safety rules/procedures, reporting requirements, and the presence/ location of known animals that should be avoided. If the plan is implemented effectively, adverse interactions with wildlife during construction would likely be minimal.

Another issue of concern during the construction phase is the potential for increased public access along the pipeline corridor and supply routes, which may lead to increased hunting and trapping pressure as well as increased disturbance of wildlife from snow machines and off-road vehicles (ORVs). Donlin Gold is aware that certain areas of the pipeline ROW, especially in the Matanuska-Susitna Borough, are currently used on a regular basis by residents from nearby communities. Donlin Gold plans to help educate people traveling through the area about safety protocols and requirements during the construction phase through its Public Outreach Plan. Donlin Gold intends to work with people to either allow controlled access through or within construction zones or provide alternate access. Appropriate notices, warning signs, and flagging would likely be used to promote public safety but barricades may also be used around dangerous areas such as open trenches. Physical barriers would also serve to protect wildlife from passing through dangerous areas, although the physical presence and noise of machinery and people may be effective for deterring wildlife.

In areas that already contain well-used trails, such as the Iditarod National Historic Trail (ADL 222930/RST-199), the presence of construction ROWs and access roads are unlikely to attract

new users or increase current uses. In fact, the noise and disruption of construction activities in remote areas may decrease the inclination of people to travel through the area. However, in areas that currently do not have established or well-used trails, such as the area north of the Alaska Range between Farewell and the mine site, the new construction ROW may substantially improve current options for access in all seasons. Given the relative scarcity of popular big game animals near established communities and convenient trails, the expansion of access to new hunting grounds may increase use of the area for hunting and trapping purposes. Many areas through which the pipeline ROW passes on the north side of the Alaska Range are early successional vegetation habitats important to moose and other species. These areas are preferred habitat and would likely be targeted by new hunters. Although construction workers would be prohibited from having firearms or hunting while on duty, their exposure to potentially new hunting areas along the ROW could eventually lead to increased hunting pressure in these areas, at least after construction activities have moved out of an area but potentially even during construction. The increase in access and hunting pressure could affect population trends for popular game species such as moose, caribou, and Dall sheep, particularly in certain areas where ORV use is or becomes practical.

While Donlin Gold would attempt to limit public use of the six new airstrips during construction of the pipeline, it is not entirely clear how residual potential uses could be controlled. Current hunting access in many areas is primarily by small aircraft that land on gravel bars, tundra, or lakes. Some hunting parties currently land at the existing air strip at Farewell with ORVs and hunt in the surrounding area. The availability of landing strips at nine additional locations could allow the expansion of hunting pressure and other recreational uses in nearby areas that were previously difficult to access. These effects might be mitigated where the landing strips can be made nonfunctional after the construction phase.

Operations and Maintenance

The pipeline ROW would be reduced to about 50 feet wide after construction and would impact about 5,963 acres of land (Table 3.10-10, Vegetation). Access roads, bridges over streams, and construction airstrips would be removed after construction, and soil would be replaced and prepared to allow natural revegetation. The buried pipeline and cutbanks would be stabilized and replanted with native grasses and shrubs to minimize erosion. The pipeline ROW would be cleared of shrubs at least every 10 years to maintain access for ground-based pipeline monitoring activities, which would be conducted with ORVs, snowmachines, and crews on foot. This modification of the habitat along the ROW to maintain early successional stages would improve browsing conditions for some species, such as moose and herbivorous small mammals, but would result in small magnitude, long-term loss of forest/shrub habitat. The resulting narrow strip of low vegetation along the buried pipeline ROW would not act as a barrier to movement for any species, although crossing it may expose some of them to higher risk of predation.

The largest potential impact of the pipeline on terrestrial mammals during the operations phase concerns improved human access to previously remote areas. The pipeline ROW would likely be used as an access route to remote areas by people using ORVs and snowmachines as well as non-mechanized means of transport such as dog teams, horses, and hiking. These potential users include residents of rural communities as well as people travelling from Alaska cities and outside the state. Guided hunting and recreational wilderness travel businesses (e.g., river rafters) may develop new business opportunities that take advantage of the pipeline ROW for

key access points. Donlin Gold would clearly mark the ROW where it would cross existing trails and may build berms or other barriers to discourage travel on the ROW. However, such efforts are not expected to prevent all use of the ROW and new trail systems may grow out from the ROW as previously remote areas get more use. Increased hunting and trapping pressure is likely to be an indirect, long-term effect on game animals and furbearers, especially in areas north of the Alaska Range that were difficult to reach before construction and clearing of the ROW. The magnitude of effect would vary by species and probably by year but could alter population trends in some areas and require additional wildlife management considerations from the Board of Game and ADF&G. The potential impacts of additional trail development off the proposed pipeline corridor cannot be predicted at this time because, while trail development is reasonably foreseeable if the project is constructed, the location and extent of additional trails is unknown.

Closure, Reclamation, and Monitoring

Donlin Gold would develop abandonment and reclamation plans in accordance with laws and regulations applicable at project closure. Currently it is anticipated that all above-ground structures associated with the pipeline would be decommissioned and removed from the ROW. Above-ground sections of pipeline would be cut and removed while the cut ends would be welded closed and buried below grade. All buried pipeline sections would be purged of natural gas, cleaned with pigs, and then abandoned in place. Major decommissioning activities would therefore only occur at a limited number of locations, would be temporary in duration, and would have a small magnitude of disturbance to terrestrial mammals given the limited amount of clearing and excavation machinery that would be required to seal and bury the pipeline.

After the pipeline is abandoned, Donlin Gold would no longer clear brush along the ROW and much of it would revert to adjacent vegetation types through natural succession. However, at least some areas of the ROW would likely have become well-used as trail access to different locations and those long-time trail users may clear sections of the ROW as needed to maintain their trails. Given the long life of the proposed project, use of the ROW for access to new hunting and trapping grounds would likely have become well-established and not likely to end just because the pipeline is decommissioned. This increased access and hunting pressure would have become the new status quo, with modifications to game management regulations to maintain sustainable populations as needed. After the pipeline is abandoned, the habitat would return to natural conditions, whatever those happen to be at the time, and wildlife populations would continue to fluctuate for a variety of reasons, although the management goal would be to regulate consumptive uses of wildlife resources and habitat characteristics for sustainability.

Summary Conclusion – Alternative 2

The analysis of effects for terrestrial mammals and amphibians is based on the magnitude, duration, geographic extent, and context for the three major components of the proposed project and the three different phases of the project. For the context of effects, most of the large terrestrial mammals are considered important resources because of their high value for subsistence and recreational hunters or, in the case of wolves and bears, because of their ecological roles as top predators. Small mammals are considered common resources in the context of this EIS analysis, primarily because of their lesser importance to human communities, although they certainly fill valuable and necessary ecological roles.

The overall direct and indirect effects of the construction, operations, and closure phases under Alternative 2 would be considered moderate from a regional perspective, based primarily on long-term but localized habitat loss, high magnitude disturbance from the noise of blasting, machines and presence of people in the mine area, which would result in barriers to normal movement patterns of animals, and a small potential for contamination of local water sources with toxic materials.

The overall direct and indirect effects of the transportation facilities under Alternative 2, including construction of port facilities and the mine access road, operation of barges and material transfer vehicles and aircraft, and closure, would be considered minor based primarily on a low magnitude of habitat loss and modification, and chronic but small magnitude disturbance from passing barges and trucks. After mine closure, potential impacts along the transportation corridor would be permanent but very low in magnitude and localized.

The overall direct and indirect effects of the natural gas pipeline construction, operations, and closure phases under Alternative 2 would be considered moderate from a regional perspective, based primarily on: 1) high magnitude but short-term disturbance and habitat loss/modification during construction, and 2) permanent, regional improvements to access for hunters and trappers which could lead to medium magnitude increases in mortality for important game species and subsequent changes in game management regulations.

The main factors leading to the conclusions regarding impacts on terrestrial mammals for each component of Alternative 2 are summarized in Table 3.12-7. These effects determinations take into account impact reducing design features (Table 5.2-1 in Chapter 5, Impact Avoidance, Minimization, and Mitigation) proposed by Donlin Gold and also the Standard Permit Conditions and BMPs (Section 5.3, Chapter 5, Impact Avoidance, Minimization, and Mitigation) that would be implemented. Several examples of these are presented below.

Design features most important for reducing impacts to terrestrial mammals and amphibians include:

- In final design, site infrastructure, material sites, and roads would avoid ground-disturbing activity in wetland areas whenever practicable. Details would be developed as the mitigation plan is developed and as design and permitting progress. Those details do not exist at the DEIS stage; and
- The project design includes routing of the pipeline and siting of the related compressor station along an existing corridor in Susitna Flats State Game Refuge to minimize impacts.

Standard Permit Conditions and BMPs most important for reducing impacts to terrestrial mammals and amphibians include:

- Monitoring of water withdrawals to ensure permitted limits are not exceeded;
- Preparation of a Wildlife Avoidance and Human Encounter/Interaction Plan;
- Implementation of Stormwater Pollution Prevention Plans (SWPPPs) and/or Erosion and Sediment Control Plans; and
- An ISMP.

Additional Mitigation and Monitoring for Alternative 2

The Corps is considering additional mitigation (Table 5.5-1 in Section 5.5, Chapter 5, Impact Avoidance, Minimization, and Mitigation) to reduce the effects presented above. These additional mitigation measures include:

- Specific plans for borrow site reclamation would be completed in a later phase of the project. In addition to standard BMPs for contouring, drainage, and erosion controls (Section 3.2, Soils), reclamation would consider creating ponds and/or stream connections for fish and wildlife habitat at borrow sites in low lying areas (e.g., at Getmuna Creek) in accordance with ADEC and ADF&G guidance (Shannon & Wilson 2012; McClean 1993); and
- Where practicable and in compliance with FAA and safety requirements, establish minimum flight altitudes (greater than 1,000 feet is recommended) to minimize impacts to Dall sheep and caribou when these animals are present in the vicinity of the work.

If these mitigation measures were adopted and required, the summary impact rating for the mine site, transportation facilities, and natural gas pipeline would be somewhat reduced but would remain moderate. No additional monitoring measures are being considered by the Corps at this time to reduce the impacts to terrestrial mammals and amphibians.

3.12.3.2.3 ALTERNATIVE 3A – REDUCED DIESEL BARGING: LNG-POWERED HAUL TRUCKS

Mine Site

There would be no change in the construction, operations, and closure phases of the mine site under Alternative 3A that would change the potential impacts to terrestrial mammals relative to those described under Alternative 2.

Transportation Facilities

Construction

Alternative 3A would greatly reduce the amount of diesel fuel needed to operate the mine and would therefore reduce the scope of barge-support facilities and diesel storage tanks in Bethel and Angyaruaq (Jungjuk) Port compared to Alternative 2. However, a reduced need for diesel fuel delivery would not substantially reduce the need for port facility and mine access road construction to address the overall material supply and transportation needs for the mine. The scale of port construction could be less than under Alternative 2 and could take less time to complete, but the incremental reduction in construction activity at Bethel and the Angyaruaq (Jungjuk) Port would likely lead to minimal reductions in potential impacts to terrestrial mammals compared to those described under Alternative 2. The potential impacts to terrestrial mammals through changes in habitat and disturbance from construction activity at Bethel and the Angyaruaq (Jungjuk) Port would likely be small in magnitude, short-term in duration, affect animals in a small geographic area, and would be considered minor for all species.

Operations and Maintenance

Alternative 3A would substantially reduce the number of fuel barge trips on the Kuskokwim River and fuel truck trips along the mine access road compared to Alternative 2. Fuel barge

trips would be greatly reduced, but cargo barge trips would be the same as Alternative 2. The potential impacts of barge traffic on terrestrial mammals would be similar in types of impacts to Alternative 2. However, given the reduced number of barges and the infrequency of terrestrial mammals crossing the river during open-water season, the potential for barge interactions with swimming mammals would be rare and even less frequent than under Alternative 2.

Barge traffic under Alternative 3A would contribute incrementally to erosion of river bank habitats through their associated wakes but such losses would be less than was described for Alternative 2. The increase over current erosion rates of riparian wetland habitats from mine-related barges was estimated to range from 0.21-acre per year downriver to 0.02-acre per year upriver under Alternative 2 conditions (see Section 3.11.4.2.2, Wetlands). This increase in erosion would be very small relative to the abundance of similar riparian habitat along the Kuskokwim River. No terrestrial mammals are likely to experience a reduction in their ability to survive or reproduce due to the potential for this minimal modification of habitat.

Truck traffic along the mine access route could disturb terrestrial mammals as they pass, but the potential for behavioral changes would be temporary and limited to animals that happened to be close to the road when a truck passes. Of course, the truck traffic will occur throughout the life of the mine, and the frequency could be as often as every 5 to 10 minutes during the barging season. Many species have adapted to vehicle traffic in other parts of the state, and disturbance effects may decrease in time as nearby animals habituate to the sounds and sights of vehicles, including the relatively few diesel fuel trucks under Alternative 3A. However, some potential for terrestrial mammals to be injured or killed due to vehicle collisions on the mine access road would remain. Given the slow speeds that Donlin Gold intends to enforce on the mine access road (35 mph or less), collisions with terrestrial mammals are likely to be rare events, especially if the Wildlife Avoidance and Human Encounter/Interaction Plan includes communication protocols for drivers to alert each other to animals near the road.

Closure, Reclamation, and Monitoring

There would be no change in the closure phase of the transportation facilities under Alternative 3A that would change the potential impacts to terrestrial mammals relative to those described under Alternative 2.

Natural Gas Pipeline

There would be no change in the construction, operations, or closure of the natural gas pipeline under Alternative 3A that would change the potential impacts to terrestrial mammals relative to those described under Alternative 2.

Summary Conclusion – Alternative 3A

The overall effects of the mine site construction, operations, and closure under Alternative 3A would be similar to Alternative 2 and would be considered moderate from a regional perspective, based primarily on long-term but localized habitat loss, high magnitude disturbance from the noise of machines and presence of people in the mine area which would result in long-term barriers to normal movement patterns of animals, and a small potential for contamination of local water sources with toxic materials.

The effects of the transportation facilities under Alternative 3A, including construction of port facilities and the mine access road, operation of barges and material transfer vehicles, and closure would be less than the effects of Alternative 2 because of the reduced need for hauling diesel fuel. The effects of Alternative 3A would be considered minor based primarily on a low magnitude of habitat loss/modification, and temporary and periodic disturbance from passing barges and trucks. After mine closure, potential impacts along the transportation corridor would be permanent but very low in magnitude and localized.

Impacts associated with climate change would also be the same as those discussed for Alternative 2.

The overall effects of the natural gas pipeline construction, operations, and closure under Alternative 3A would be the same as Alternative 2 and would be considered moderate based primarily on: 1) high magnitude but short-term disturbance and habitat loss/modification during construction, and 2) permanent, regional improvements to access for hunters and trappers which could lead to medium magnitude increases in mortality for important game species and subsequent changes in game management regulations.

These effects determinations take into account applicable impact reducing design features and BMPs, as discussed in Alternative 2. If the mitigation measures discussed under Alternative 2 were to be implemented, the impacts would be similar to Alternative 2, and would remain moderate.

3.12.3.2.4 ALTERNATIVE 3B – REDUCED DIESEL BARGING: DIESEL PIPELINE

Mine Site

There would be no change in the construction, operations, or closure of the mine site under Alternative 3B that would change the potential impacts to terrestrial mammals relative to those described under Alternative 2.

Transportation Facilities

Construction

Alternative 3B would not require the construction of large diesel storage tanks and transfer facilities at Bethel and the Angyaruaq (Jungjuk) Port, although smaller diesel storage tanks would likely be needed to service port vehicles. The port facilities would still be substantial and the mine access road would be the same as under Alternative 2. The transport of equipment and supplies for construction on the Kuskokwim River would otherwise be the same as Alternative 2. Alternative 3B would require improvements to the Tyonek North Foreland Barge Facility to accommodate vessels in excess of 30,000 gross tons and construction of fuel unloading facilities capable of accommodating the proposed volume of diesel fuel. The dock would need to be extended an additional 1,500 feet, and piles would need to be driven to support it. Dredging would not be required, as the dock would be extended out to the desired water depth. The effects of transportation facilities construction on terrestrial mammals would be similar to Alternative 2, and would involve high magnitude, temporary to short-term disturbance of localized populations of terrestrial mammals at the port sites and along the access road. Habitat loss/modification due to construction activities would be low in magnitude relative to the

abundance of similar adjacent habitat (common resources), local in extent, permanent along the footprint of the road and Angyaruaq (Jungjuk) Port site, and long term at the Tyonek site.

Operations and Maintenance

Alternative 3B would eliminate the need to barge diesel fuel from Bethel to the Angyaruaq (Jungjuk) Port and to transport diesel in fuel trucks along the mine access road. River barges and transport trucks would still be required to deliver consumable materials and other supplies to the mine site but the elimination of diesel transport would reduce the number of river barge trips on the Kuskokwim River to about half the number required under Alternative 2. A similar reduction of truck traffic on the access road could be expected under Alternative 3B. The effects of operating the transportation system on terrestrial mammals would therefore be about half of what they could be under Alternative 2 and would involve medium magnitude, temporary disturbance of localized populations of terrestrial mammals from passing barges on the Kuskokwim River and trucks on the access road. Such disturbance could temporarily inhibit animals from using small amounts of common riparian and forest habitats. The potential for injury and mortality of animals due to collisions with vehicles would be less than under Alternative 2 and would be considered minimal given slow vehicle speeds and light traffic.

Closure, Reclamation, and Monitoring

The closure of the transportation facilities under Alternative 3B would have similar potential impacts to terrestrial mammals relative to those described under Alternative 2.

Diesel Pipeline

Construction

Alternative 3B would involve the same basic pipeline construction techniques and schedule as Alternative 2 and would occur along the same route with the addition of a 19-mile segment from Tyonek to Beluga under Alternative 3B. The diesel pipeline of Alternative 3B would be incrementally larger than the natural gas pipeline proposed under Alternative 2 and would require the installation of additional check valves and other structures to help prevent fuel spills and to limit fuel release in the case of a catastrophic pipeline rupture. However, the main types of effects on terrestrial mammals from pipeline construction would be loss/modification of habitat and disturbance from all the heavy machinery needed to clear the ROW, dig the trench, and install the pipeline. Construction of a diesel pipeline under Alternative 3B would have the same scope of direct effects on wildlife as described for the natural gas pipeline under Alternative 2; disturbance of common and important terrestrial mammal resources would be high magnitude, regional in extent, and last only during pipeline construction (temporary or short-term). The 19-mile stretch of pipeline from Tyonek would impact at least an additional 250 acres of primarily shrub/forest habitat (see Table 3.10-12, in Section 3.10, Vegetation) plus any additional work sites or material pits that may be needed to build that stretch of the pipeline. The rest of the pipeline would have the same impacts on wildlife habitat as described under Alternative 2; loss/modification of common habitat resources would be high in magnitude, temporary to permanent in duration (some areas only affected during construction but other areas with effects lasting well after the life of the project), and regional in extent. The potential effects of the diesel pipeline ROW concerning improved access and subsequent

increased hunting and trapping pressure on important game species would be similar to those described under Alternative 2.

Operations and Maintenance

The potential for environmental damage from a diesel pipeline rupture would be much greater than the risk from a natural gas pipeline rupture, so pipeline monitoring and spill prevention measures could require the maintenance of helicopter pads and airstrips at various points along the diesel pipeline corridor as well as additional access roads under Alternative 3B. It is not clear how or if these long-term facilities could be kept from public use, since the project use of them would be much less than during the construction phase. For the purposes of this EIS analysis, it is assumed that such facilities would add to the potential impacts to terrestrial mammals described for Alternative 2 from increased access of hunters, trappers, and other recreational users to areas along the pipeline route that are currently difficult to access, especially areas north of the Alaska Range between Farewell and the mine site. Improved access along the pipeline corridor for travel with ORVs, snow machines, and non-motorized modes of transport could lead to substantial increases in hunting and trapping pressure, which could cause changes in population trends for important game species and require substantial changes in game management regulations to maintain sustainable populations of certain species. New access patterns and ancillary trail systems would likely be established from the pipeline corridor, impacting several Game Management Units and lasting well beyond the life of the project (permanent effects). Because a diesel pipeline would have more serious issues with potential spills and cleanup than a natural gas pipeline, more ground-level access points would need to be maintained relative to the natural gas pipeline alternatives to address potential pipeline ruptures, which could lead to greater indirect effects to wildlife from improved hunter access.

Two diesel pipeline sections at fault crossings would need to remain on the surface rather than being buried. These above-ground sections may have to be protected by fencing or be elevated to reduce the potential for vandalism. These sections are expected to be no more than a few hundred feet in length and, while they could inhibit some mammals from traveling through the area and may contribute to habitat fragmentation for some species, that is considered a minor effect.

Closure, Reclamation, and Monitoring

Closure activities for a diesel pipeline would be similar to those described for a natural gas pipeline under Alternative 2 but could be greater in magnitude due to a larger number of airstrips and long-term roads. Decommissioning would involve use of a limited amount of heavy machinery in some areas along the pipeline corridor with associated wildlife and habitat disturbance effects, but the magnitude, extent, and duration of effects on terrestrial mammals would be considerably less than during the construction phase because many stretches of pipeline would be cleaned and abandoned in place. As mentioned above, the pipeline corridor could continue to provide improved access to ORVs and non-motorized modes of transport even after the pipeline is closed. Potential impacts on important terrestrial mammal populations from hunting and trapping pressure could be moderate in magnitude and extend well beyond the closure phase.

Summary Conclusion – Alternative 3B

The overall effects of the mine site development, operations, and closure under Alternative 3B would be the same as Alternative 2 and would be considered moderate from a regional perspective, based primarily on long-term but localized habitat loss, high magnitude disturbance from the noise of machines and presence of people in the mine area, and a small potential for contamination of local water sources with toxic materials.

The overall effects of the transportation facilities on terrestrial mammals under Alternative 3B, including construction of port facilities and the mine access road, operation of barges and material transfer vehicles, and closure would be less than the effects of Alternative 2 because the need to haul diesel fuel would be eliminated. The effects of Alternative 3B would be considered minor based primarily on a low magnitude of habitat loss and modification, and temporary disturbance from passing barges and trucks. After mine closure, potential impacts along the transportation corridor would be permanent but very low magnitude and localized.

Impacts associated with climate change would also be the same as those discussed for Alternative 2.

The overall effects of the diesel pipeline construction, operations, and closure under Alternative 3B would be greater than those described for Alternative 2 because of a longer pipeline route, the more complicated construction phase, and more permanent access roads. The effects on terrestrial mammals would be considered moderate based primarily on high magnitude but short-term disturbance and habitat loss/modification during construction, and permanent, regional improvements to access for hunters and trappers which could lead to medium magnitude increases in mortality for important game species and subsequent changes in game management regulations.

The summary of direct and indirect effects of Alternative 3B on terrestrial mammals would be considered moderate and adverse based primarily on the long-term or permanent, regional, low to medium magnitude effects on important resources as summarized above.

These effects determinations take into account applicable impact reducing design features and BMPs, as discussed in Alternative 2. If the mitigation measures discussed under Alternative 2 were to be implemented, the impacts would be similar to Alternative 2, and would remain moderate.

3.12.3.2.5 ALTERNATIVE 4 – BIRCH TREE CROSSING PORT

Mine Site

There would be no change in the construction, operations, or closure of the mine site under Alternative 4 that would change the potential impacts to terrestrial mammals relative to those described under Alternative 2.

Transportation Facilities

Construction

Construction of a new port site at BTC and the mine access road from that site would have the same general types of effects on terrestrial mammals as described for the same phase under

Alternative 2. The BTC Port site has similar types of riparian/boreal forest habitats as the Angyaruaq (Jungjuk) Port site, so the potential loss/modification of wildlife habitat would be similar (but more acres at BTC). The access road from the BTC Port site would be more than twice as long (76 miles) as the road from the Angyaruaq (Jungjuk) Port site (30 miles) and would impact almost 1,800 acres of primarily shrub and coniferous forest habitat types (see Table 3.10-13, Vegetation). The amount of habitat permanently lost to the port site and access road would be more than twice the amount in Alternative 2, but would be a long, narrow clearing and the overall magnitude of habitat loss would be considered small relative to the amount of similar habitat in the surrounding area. Construction details have not been developed, but the land clearing and road construction work from the BTC Port site would either take longer to build or require larger construction crews than a road from the Angyaruaq (Jungjuk) Port site. The temporary winter access road up Crooked Creek would allow construction crews to be working from both ends of the road.

Impacts on terrestrial mammals from port and road construction would include high intensity disturbance from land clearing equipment, gravel mining, and heavy machinery used for hauling, placing, and leveling the road surface and building the port. The effects would be the same types as with Alternative 2, but the extent would be larger.

Operations and Maintenance

Alternative 4 offers a tradeoff of effects relative to alternatives using the Angyaruaq (Jungjuk) Port site: potential impacts to terrestrial wildlife from barge traffic and the risk of fuel spills in the Kuskokwim River are reduced while potential impacts from mine access road vehicles and fuel spills on the road are increased. Both port site and mine access road options would have disturbance, habitat loss/modification, and potential injury and mortality impacts on wildlife but such effects would occur in different locations and to different extents. Impacts to wildlife due to disturbance during the operation of the BTC Port site would be small in magnitude, localized, and periodic. The mine access road from the BTC Port site would be longer than from the Angyaruaq (Jungjuk) Port site and would therefore require more trucks on the road to deliver the same amount of goods. The number of vehicles traveling between the port and mine sites would be about double the number required if the port site was at Angyaruaq (Jungjuk). The trucks would pass a given point about every 5 to 10 minutes over a 14 hour period each day through the shipping season. The risk of vehicle collisions would also be about double that of Alternative 2. Given the slow speeds of mine-related vehicles and the relatively small number of vehicle transits per day, collisions with large mammals would likely be rare. On a gold mine haul road in Washington state with similar speed restrictions, monitoring found only about 1 deer per year was found dead (along with 1 bird and 3 small mammals), and part of those were killed by personal vehicles, not the haul trucks (Golder 2014, 2015).

Both alternatives would have the potential to affect the ability of local residents to use the areas around the access road for traditional hunting (as well as other subsistence activities such as fishing and berry picking). The road from the BTC Port site would cross the Owhat River watershed, which is an important area for subsistence activities for people from several communities (URS 2014e). Donlin Gold intends to prohibit public use of the access road for safety reasons, including use by local residents. Traditional use of the surrounding area for subsistence hunting, trapping, and berry picking could be inhibited, potentially resulting in localized increases in game species and furbearer populations through reduced hunting and trapping pressure. However, access to these areas by traditional means and routes may not be

affected unless the access requires crossing mine-restricted property. Another related issue is the potential for traffic on the road to disturb wildlife and change their distribution or movement patterns through avoidance of the road and its associated noise and traffic. Given the increased number of vehicle transits per day, the magnitude of disturbance would be larger, but also periodic, and localized.

Alternative 4 would shift the location of potential impacts on terrestrial mammals relative to the Angyaruaq (Jungjuk) Port site alternatives, but the magnitude and duration of effects during the operations phase would be generally similar, while the extent would be larger. The operation of the transportation facilities under Alternative 4 would have potential impacts on both “common” and “important” terrestrial mammal species. These potential impacts would primarily include low magnitude and temporary disturbance in localized areas. Potential impacts on wildlife habitat types would likely be of low magnitude relative to the abundance of similar nearby habitat. However, given the intention of Donlin Gold to maintain the port and mine access road indefinitely to support monitoring efforts after the mine is closed, the potential habitat effects of the mine access road and port would be considered long-term or permanent effects.

Closure, Reclamation, and Monitoring

After mine closure, barge traffic and truck traffic on the mine access road would be greatly reduced but would continue on a permanent basis at very low levels. The potential effects of the transportation facilities on terrestrial mammals through direct interactions and impacts on habitat would therefore be of very low magnitude, localized, and permanent. Even though the port facilities would be removed after closure, the mine access road would likely be accessible by river boat and 4-wheelers (ATVs), which are common modes of transportation for hunters. The access road would therefore likely make it easier for local residents or other hunters to access wildlife habitat along the mine access road and mine site and the resulting increase in hunting pressure could lead to decreased local populations of popular game species. Game management regulations are intended to maintain sustainable populations within larger management areas and are not often designed to address localized depletions of game. Hunting pressure in a given area may decline if hunter success rates are poor but may still be enough to keep local game populations depressed.

Natural Gas Pipeline

There would be no change in the construction, operations, or closure of the natural gas pipeline under Alternative 4 that would change the potential impacts to terrestrial mammals relative to those described under Alternative 2.

Summary Conclusion – Alternative 4

The overall effects of the mine site development, operations, and closure under Alternative 4 would be generally the same as Alternative 2 and would be considered moderate based primarily on long-term but localized habitat loss, high magnitude disturbance from the noise of machines and presence of people in the mine area, and small potential for contamination of local water sources with toxic minerals.

The overall effects of the transportation facilities under Alternative 4, including construction of port facilities and the mine access road, operation of barges and material transfer vehicles and

aircraft, and closure would be similar to the effects of Alternative 2 because potential impacts to terrestrial mammals from barge traffic would be about the same and the road would be longer, although the relative importance of those potential effects may vary. The effects of Alternative 4 would be considered minor based primarily on a low magnitude of habitat loss and modification, and temporary disturbance from passing barges and trucks. After mine closure, potential impacts would be permanent but very low magnitude and localized.

Impacts associated with climate change would also be the same as those discussed for Alternative 2.

The overall effects of the natural gas pipeline construction, operations, and closure under Alternative 4 would be the same as Alternative 2 and would be considered moderate based primarily on: 1) high magnitude but short-term disturbance and habitat loss/modification during construction, and 2) permanent, regional improvements to access for hunters and trappers which could lead to medium magnitude increases in mortality for important game species and subsequent changes in game management regulations.

The summary direct and indirect effects of Alternative 4 on terrestrial mammals would be considered moderate and adverse from a regional perspective, based primarily on the long-term or permanent, regional, low to medium magnitude effects on important resources as summarized above.

These effects determinations take into account applicable impact reducing design features and BMPs, as discussed in Alternative 2. If the mitigation measures discussed under Alternative 2 were to be implemented, the impacts would be similar to Alternative 2, and would remain moderate.

3.12.3.2.6 ALTERNATIVE 5A – DRY STACK TAILINGS

Mine Site

The TSF would include the dry stack tailing facility and an operating pond. The water quality of the operating pond would be expected to be similar to that of the TSF water in Alternative 2. The operating pond would be lined, so it would not be likely to have vegetation or invertebrates around its perimeter. The exposure of wildlife and effects would be similar to Alternative 2.

The seepage collection system and water management would prevent contaminated water from reaching creeks downgradient. Given the facility design, monitoring requirements, and emergency response requirements under any permitted mine facility, the potential for exposure of wildlife to toxic water sources downstream from the mine site would be considered minimal under Alternative 5A. See Section 3.24, Spill Risk, for a discussion of the potential for system failures that could lead to toxic releases into the environment and a discussion of the potential impacts on wildlife.

Transportation Facilities

There would be no change in the construction or closure phases of the transportation facilities under Alternative 5A that would change the potential impacts to terrestrial mammals relative to those described under Alternative 2. However, the dry stack methodology could increase the demand for diesel fuel used by heavy machinery to haul and compact tailings and reagents used in the dry stack process, thus increasing the volume of barge and trucking along the

transportation corridor. This higher level of transport activity would cause more frequent disturbance of terrestrial mammals along the Kuskokwim River and the mine access road. It could also incrementally raise the risk of fuel spills, chemical spills, and vehicle accidents, both in the Kuskokwim River and along the road corridor.

Natural Gas Pipeline

There would be no change in the construction, operations, or closure of the natural gas pipeline under Alternative 5A that would change the potential impacts to terrestrial mammals relative to those described under Alternative 2.

Summary Conclusion – Alternative 5A

The overall effects of the mine site development, operations, and closure under Alternative 5A would be similar to Alternative 2 and would be considered moderate from a regional perspective, based primarily on long-term but localized habitat loss, high magnitude disturbance from the noise of machines and presence of people in the mine area, and a small potential for contamination of local water sources with toxic minerals.

The overall effects of the transportation facilities under Alternative 5A, including construction of port facilities and the mine access road, operation of barges and material transfer vehicles, and closure would be the same as Alternative 2 and would be considered minor based primarily on a low magnitude of habitat loss/modification, and temporary disturbance from passing barges and trucks. After mine closure, potential impacts would be permanent but very low magnitude and localized.

Impacts associated with climate change would also be the same as those discussed for Alternative 2.

The overall effects of the natural gas pipeline construction, operations, and closure under Alternative 5A would be the same as Alternative 2.

The summary direct and indirect effects of Alternative 5A on terrestrial mammals would be considered moderate and adverse based primarily on the long-term or permanent, regional, low to medium magnitude effects on important resources as summarized above.

These effects determinations take into account applicable impact reducing design features and BMPs, as discussed in Alternative 2. If the mitigation measures discussed under Alternative 2 were to be implemented, the impacts would be similar to Alternative 2, and would remain moderate.

3.12.3.2.7 ALTERNATIVE 6A – MODIFIED NATURAL GAS ALIGNMENT: DALZELL GORGE ROUTE

Mine Site

There would be no change in the construction, operations, or closure of the mine site under Alternative 6A that would change the potential impacts to terrestrial mammals relative to those described under Alternative 2.

Transportation Facilities

There would be no change in the construction, operations, or closure of the transportation facilities under Alternative 6A that would change the potential impacts to terrestrial mammals relative to those described under Alternative 2.

Natural Gas Pipeline

Under Alternative 6A, the proposed natural gas pipeline route would traverse Dalzell Gorge between Milepost 106.5 and Milepost 152.7 but would otherwise follow the same alignment as under Alternative 2. Alternative 6A would therefore include the same types of effects on terrestrial mammals as described for Alternative 2 (Section 3.12.3.2.2), including habitat loss/modification, disturbance, and indirect effects of improved access for hunters and other wilderness travelers. The difference between alternatives would involve similar impacts to wildlife in different areas of the Alaska Range that have the same types of wildlife habitat and wildlife species present. For most species of terrestrial mammals, there is not enough information on the relative abundance of animals in the different areas to distinguish between the alternative alignments in regard to potential magnitudes of effect. The two species for which the magnitude of effects may differ are caribou and bison.

The Dalzell Gorge alignment would traverse through or near more of the Rainy Pass caribou herd range (Figure 3.12-1) than the alignment under Alternative 2. Both alignments would pass through about the same amount of the Big River-Farewell herd range north of the Alaska Range. Both alignments pass through the Farewell bison herd's core range and pass less than one mile from the important mineral lick areas (Figure 3.12-2). The Alternative 6A alignment drops down to the South Fork of the Kuskokwim River valley as it flows north out of the Alaska Range. This area could be used more frequently by caribou and bison in non-winter months relative to the Alternative 2 alignment to the east. The highest magnitude of effects for either species would likely occur during the construction phase of the pipeline.

The proposed construction schedule for Alternative 6A is different than the proposed schedule for Alternative 2 for the section of the pipeline through the northern half of the Alaska Range. Under Alternative 6A, the spread along the South Fork River north to the Farewell mineral lick area would be completed from November through March. Most of the moose, caribou, and bison in the area would likely be further north in the lowlands during this period, although there could be areas with higher concentrations of these species in protected areas. Use of the Farewell mineral lick area would likely be minimal at this time of year due to snow cover. Those relatively few animals that were nearby when construction activities occurred would likely be subject to high levels of noise and disturbance that would cause them to leave the area. Such high magnitude disturbance and displacement effects would be temporary or short-term and localized.

The southern stretch of this alignment in the mountains would be constructed during the summer, as would the similar stretch under Alternative 2, so the effects on Dall sheep and other higher elevation species would be similar, with high levels of disturbance in localized areas for short periods of time.

Summary Conclusion – Alternative 6A

The overall effects of the mine site development, operations, and closure under Alternative 6A would be the same as Alternative 2 and would be considered moderate based primarily on long-term but localized habitat loss, high magnitude disturbance from the noise of machines and presence of people in the mine area, and a small potential for contamination of local water sources with toxic minerals.

The overall effects of the transportation facilities under Alternative 6A, including construction of port facilities and the mine access road, operation of barges and material transfer vehicles, and closure would be the same as Alternative 2 and would be considered minor based primarily on a low magnitude of habitat loss/modification, and temporary disturbance from passing barges and trucks. After mine closure, potential impacts would be permanent but very low magnitude and localized.

Impacts associated with climate change would also be the same as those discussed for Alternative 2.

The overall effects of the natural gas pipeline construction, operations, and closure under Alternative 6A would be similar to Alternative 2 and would be considered moderate based primarily on: 1) high magnitude but short-term disturbance and habitat loss/modification during construction, and 2) permanent, regional improvements to access for hunters and trappers which could lead to medium magnitude increases in mortality for important game species and subsequent changes in game management regulations.

The summary direct and indirect effects of Alternative 6A on terrestrial mammals would be considered moderate and adverse based primarily on the long-term or permanent, regional, low to medium magnitude effects on important resources as summarized above.

These effects determinations take into account applicable impact reducing design features and BMPs, as discussed in Alternative 2. If the mitigation measures discussed under Alternative 2 were to be implemented, the impacts would be similar to Alternative 2, and would remain moderate.

3.12.3.2.8 IMPACT COMPARISON – ALL ALTERNATIVES

A comparison of the impacts to terrestrial mammals and amphibians by alternative is presented in Table 3.12-8. As this table shows, the overall impact levels are similar between alternatives. The table allows the comparison of individual impact types by alternative so that the alternative with the lowest impact (where they are different) can be identified.

Table 3.12-8: Comparison of Impacts by Alternative*, Terrestrial Mammals and Amphibians

Impact- causing Project Component	Alt. 2 – Proposed Action	Alt. 3A – LNG-Powered Haul Trucks	Alt. 3B – Diesel Pipeline	Alt. 4 – BTC Port	Alt. 5A – Dry Stack Tailings	Alt. 6A – Dalzell Gorge Route
Mine Site						
Habitat loss or alteration	8,955 acres of habitat loss before reclamation, primarily forest/shrub	8,955 acres impacted, additional LNG Plant and storage tanks, reduced onsite diesel storage.	Same as Alt. 2	Same as Alt. 2	8,867 acres habitat loss before reclamation, primarily forest/shrub	Same as Alt. 2
Risk of injury or mortality	Potential for moderate impacts from vehicle collisions or displacement during construction	Potential for moderate impacts, but fewer fuel trucks lowers potential for vehicle collisions.	Potential for moderate impacts, but fewer fuel trucks lowers potential for vehicle collisions.	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Introduction of invasive species	Low potential for minor impacts (for plants and Norway rats)	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Behavioral disturbance	Minor to moderate depending on species sensitivity	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Barriers to movement	Potential for Moderate impacts (depending on species mobility)	Potential for moderate impacts, but fewer fuel trucks lowers the risk.	Potential for moderate impacts, but fewer fuel trucks lowers the risk.	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Increased hunting/trapping pressure	Minor (controlled access during operations)	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Contamination	BMPs would reduce impacts to minor	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2

Table 3.12-8: Comparison of Impacts by Alternative*, Terrestrial Mammals and Amphibians

Impact- causing Project Component	Alt. 2 – Proposed Action	Alt. 3A – LNG-Powered Haul Trucks	Alt. 3B – Diesel Pipeline	Alt. 4 – BTC Port	Alt. 5A – Dry Stack Tailings	Alt. 6A – Dalzell Gorge Route
Transportation Facilities						
Habitat loss or alteration	Angyaruaq (Jungjuk) Port site 30-mile road 872.9 acres impacted	Same as Alt. 2	Angyaruaq (Jungjuk) and Tyonek Port sites 30-mile road 872.9 acres impacted.	BTC Port site 76-mile road 1,791.3 acres impacted - more than twice the amount of the other alternatives	Same as Alt. 2	Same as Alt. 2
Behavioral Disturbance	Disturbance to riparian mammals from barge trips: 122 river trips/year and 26 ocean trips/ year from Dutch Harbor to Bethel.	Lower amount of disturbance to riparian mammals from fewer barge trips: 83 river trips/ year. 17 ocean trips/year from Dutch Harbor to Bethel	Lowest amount of disturbance to riparian mammals from fewest barge trips: 64 river trips/year. 12 ocean trips/year from Marine Terminals in Pacific Northwest or from Tesoro Refinery in Nikiski to Tyonek	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2

Table 3.12-8: Comparison of Impacts by Alternative*, Terrestrial Mammals and Amphibians

Impact- causing Project Component	Alt. 2 – Proposed Action	Alt. 3A – LNG-Powered Haul Trucks	Alt. 3B – Diesel Pipeline	Alt. 4 – BTC Port	Alt. 5A – Dry Stack Tailings	Alt. 6A – Dalzell Gorge Route
Risk of injury or mortality	Potential for minor impacts from construction or vehicle collisions	Fewer fuel trucks lower potential for vehicle-caused impacts	Fewer fuel trucks lower potential for vehicle-caused impacts	Longer road increases potential for vehicle collisions	Same as Alt. 2	Same as Alt. 2
Contamination	BMPs would reduce impacts to minor	Fewer barge trips reduces risk	Diesel pipeline and unloading facilities introduce additional risk.	Longer road would increase some risks.	Same as Alt. 2	Same as Alt. 2
Pipeline						
Habitat loss or alteration	315-mile long natural gas 5,964 acres	Same as Alt. 2	334-mile long diesel 6,215 acres	Same as Alt. 2	Same as Alt. 2	314-mile long natural gas 5,728 acres

Table 3.12-8: Comparison of Impacts by Alternative*, Terrestrial Mammals and Amphibians

Impact- causing Project Component	Alt. 2 – Proposed Action	Alt. 3A – LNG-Powered Haul Trucks	Alt. 3B – Diesel Pipeline	Alt. 4 – BTC Port	Alt. 5A – Dry Stack Tailings	Alt. 6A – Dalzell Gorge Route
Behavioral Disturbance	Minor to Moderate depending on species sensitivity	Same as Alt. 2	Minor to Moderate depending on species sensitivity. Increased risk of impacts due to longer pipeline route more complicated construction phase, and more permanent access roads.	Same as Alt. 2	Same as Alt. 2	Minor to Moderate depending on species sensitivity. Potential for more impacts to caribou and bison during construction phase.
Barriers to movement	Potential for minor localized impacts, mostly during construction.	Same as Alt. 2	Potential for minor localized impacts, mostly during construction. Increased risk of impacts due to longer pipeline route, more complicated construction phase, and more permanent access roads.	Same as Alt. 2	Same as Alt. 2	Potential for minor localized impacts, mostly during construction. Potential for more impacts to caribou and bison.

Table 3.12-8: Comparison of Impacts by Alternative*, Terrestrial Mammals and Amphibians

Impact- causing Project Component	Alt. 2 – Proposed Action	Alt. 3A – LNG-Powered Haul Trucks	Alt. 3B – Diesel Pipeline	Alt. 4 – BTC Port	Alt. 5A – Dry Stack Tailings	Alt. 6A – Dalzell Gorge Route
Risk of injury or mortality	Potential for moderate impacts due to improved access for hunters along pipeline route	Same as Alt. 2	Potential for moderate impacts due to improved access for hunters along pipeline route. Longer route has incrementally greater risk.	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Contamination	BMPs would reduce impacts to minor	Same as Alt. 2	The potential for environmental damage from a diesel pipeline rupture is much greater than the risk from a natural gas pipeline rupture, requiring the maintenance of helicopter pads and airstrips at various points along the diesel pipeline corridor as well as additional access roads.	Longer road would increase some risks.	Same as Alt. 2	Same as Alt. 2

Table 3.12-8: Comparison of Impacts by Alternative*, Terrestrial Mammals and Amphibians

Impact- causing Project Component	Alt. 2 – Proposed Action	Alt. 3A – LNG-Powered Haul Trucks	Alt. 3B – Diesel Pipeline	Alt. 4 – BTC Port	Alt. 5A – Dry Stack Tailings	Alt. 6A – Dalzell Gorge Route
Overall Summary						
All components	<p>Moderate impacts from disturbance from the noise of blasting, machines and presence of people which would result in barriers to movement patterns of animals, and increased risk of contamination of local water sources with toxic materials, and permanent, regional improvements to access for hunters and trappers.</p> <p><u>Overall effects would be moderate.</u></p>	<p>Reduced barge-related impacts. Same level of other impacts described under Alt 2.</p> <p><u>Overall effects would be moderate.</u></p>	<p>Reduced barge-related impacts. Diesel pipeline means more risk of contamination, Longer pipeline means more habitat loss and more access roads.</p> <p>Same level of other impacts described under Alt 2.</p> <p><u>Overall effects would be moderate.</u></p>	<p>Reduced barge-related impacts from different port site. Increased impacts from vehicles on the longer mine access.</p> <p>Same level of other impacts described under Alt 2.</p> <p><u>Overall effects would be moderate.</u></p>	<p>Same as Alt. 2</p> <p><u>Overall effects would be moderate.</u></p>	<p>Different pipeline route means more impacts to caribou and bison non-winter range during construction. Same level of other impacts described under Alt 2.</p> <p><u>Overall effects would be moderate.</u></p>

Notes:

* The No Action Alternative would have no new impacts on terrestrial mammals and amphibians.

3.12.4 MARINE MAMMALS

3.12.4.1 AFFECTED ENVIRONMENT

Marine mammals, including pinnipeds (seals, sea lions, and walruses) and cetaceans (whales, dolphins, and porpoises), occur within the vicinity of the marine and river portions of the proposed transportation corridor in Kuskokwim Bay and the Kuskokwim River, and upper Cook Inlet. The eastern Bering Sea also supports several marine mammal species, some of which frequent Kuskokwim Bay adjacent to the proposed transportation corridor, the Dutch Harbor to Bethel barge corridor, and the Anchorage to Beluga barge corridor in Cook Inlet. Non-ESA listed pinniped and cetacean species found within the EIS Analysis Area are listed in Table 3.12-9 and described in detail below. Threatened and endangered (ESA-listed) marine mammal species are noted in Section 3.12.4.1.3, Protected Species, and further described in Section 3.14.1.1, Threatened and Endangered Species.

Table 3.12-9: Project Area Marine Mammals that are not ESA-listed

Common Name	Scientific Name	Stock	Kuskokwim Bay and River	Dutch Harbor-Bethel Barge Corridor	Cook Inlet near Beluga Barge Landing
Harbor seal	<i>Phoca vitulina richardii</i>	Bristol Bay	X		
		Aleutian Islands		X	
		Cook Inlet/Shelikof			X ¹
Spotted seal	<i>Phoca largha</i>	Alaska	X		
Beluga whale	<i>Delphinapterus leucas</i>	Eastern Bering Sea	X	X	
Harbor porpoise	<i>Phocoena phocoena</i>	Gulf of Alaska			X
		Bering Sea	X	X	
Dall's porpoise	<i>Phocoenoides dalli</i>	Alaska		X	X
Killer whale	<i>Orcinus orca</i>	Alaska Resident stock	X	X	
		Gulf of Alaska, Aleutian Islands, and Bering Sea Transient stock	X	X	X
Minke whale	<i>Balaenoptera acutorostrata</i>	Alaska		X	
Gray whale	<i>Eschrichtius robustus</i>	Eastern North Pacific		X	

Notes:

An X denotes presence in the area.

¹ Although considered part of the range of the Cook Inlet/Shelikof Strait stock (Allen and Angliss 2013), all of the known haul out sites along western Cook Inlet included in abundance surveys are in central to lower Cook Inlet, the northern boundary of which is at West Foreland (Boveng et al. 2003, Montgomery et al. 2007), south of the proposed Project Area.

Sources: ADF&G 2013a, 2013b; Coffing et al. 1999; MacDonald and Winfree 2008; RWJ Consulting 2008b, 2009, 2010b; Allen and Angliss 2015; Boveng et al. 2009; Coffing 1991; Juneau Empire 2008; Frost et al. 1992; Zerbini et al. 2007; Moore et al. 2002; Friday et al. 2013; Rugh et al. 1999.

3.12.4.1.1 PINNIPEDS

Seals are the most common marine mammals observed in the Kuskokwim River (RWJ Consulting Inc. 2010b). Based on surveys and subsistence harvest information from Quinhagak, Kwethluk, and Akiak, pinnipeds occurring in Kuskokwim Bay and up the Kuskokwim River include harbor (*Phoca vitulina richardii*) and spotted (*P. largha*) seals, ringed seals (*P. hispida*), bearded seals (*Erignathus barbatus*), Steller sea lions (*Eumetopias jubatus*), and Pacific walrus (*Odobenus rosmarus divergens*) (ADF&G 2013a, 2013b; Coffing et al. 1999; MacDonald and Winfree 2008; RWJ Consulting 2010b). With the exception of harbor and spotted seals, all are either listed or candidates for listing under the ESA and are discussed in Section 3.14, Threatened and Endangered Species. Harbor seals and spotted seals are closely related and often confused where their ranges overlap in the southern Bering Sea, including in northern Bristol Bay and Kuskokwim Bay (Quakenbush 1988). Observations recorded during surveys of the Kuskokwim River by RWJ Consulting Inc. did not distinguish the species, which they noted as spotted/harbor seals (RWJ Consulting Inc. 2008c, 2009, 2010b). The species are described here separately, but reference to these observations are as spotted/harbor seals.

Harbor Seals (*Phoca vitulina richardii*): Bristol Bay Stock

In 2010, the NMFS and the Alaska Native Harbor Seal Commission defined 12 separate stocks of harbor seals in Alaska based largely on their genetic structure, along with population trends, movements, and traditional Alaska Native use areas. This is a substantial increase over the three previously recognized stocks (Bering Sea, Gulf of Alaska, and Southeast Alaska). The 12 stocks are: the Aleutian Islands stock; the Pribilof Islands stock; the Bristol Bay stock; the North Kodiak stock; the South Kodiak stock; the Prince William Sound stock; the Cook Inlet/Shelikof stock; the Glacier Bay/Icy Strait stock; the Lynn Canal/Stephens stock; the Sitka/Chatham stock; the Dixon/Cape Decision stock; and the Clarence Strait stock (Allen and Angliss 2015). The Bristol Bay stock includes harbor seals seen in Kuskokwim Bay and the Kuskokwim River.

The National Marine Mammal Laboratory (Alaska Fisheries Science Center) conducts aerial surveys of harbor seals across their entire range in Alaska from which they derive population estimates. The most recent survey of Bristol Bay in 2005 resulted in an estimated abundance of 18,577 harbor seals (Allen and Angliss 2015). Data from the NMFS aerial surveys suggest an increasing trend for this stock (NMFS unpublished data, cited in Allen and Angliss 2015).

The largest haulout in northern Bristol Bay and closest to Kuskokwim Bay is at Nanvak Bay. It is also the northernmost pupping area for harbor seals in Bristol Bay and an area where the ranges of harbor seals and spotted seals overlap. Both species appear to haul out there (MacDonald and Winfree 2008). In 2010, the highest count of harbor seals in Nanvak Bay was 400 in mid-September (Winfree 2010).

In general, site fidelity in harbor seals is considerable and long range movements are rare. However, some long distance movements of tagged harbor seals have been documented in Alaska (Lowry et al. 2001). Seals, mostly spotted/harbor seals, were the most abundant marine mammal sighted on the Kuskokwim River during summer surveys in 2006-2009. Numbers of spotted/harbor seals sighted ranged from 11 in 2009 to 68 in 2007, with peak sightings in July-August (RWJ Consulting Inc. 2008c, 2009, 2010b). Harbor seals are also occasionally observed along the southern Kuskokwim Bay coast during spring and fall emperor goose aerial surveys. In early May 2009, 35 harbor seals were recorded near Chagvan Bay; 275 were recorded there in late-September that year (Dau and Mallek 2009, Mallek and Dau 2009).

Harbor seals feed opportunistically on a wide variety of fish and invertebrates (Iverson et al. 1997). Their diet varies seasonally, regionally, and most likely, annually. Common prey items include herring, pollock, salmon, cod, squid, and crustaceans (Jemison 2001; Iverson et al. 1997).

Spotted Seals (*Phoca largha*): Alaska Stock

The Alaska stock of spotted seals includes three Distinct Population Segments (DPSs) based on genetics, geography and breeding groups: the Bering DPS; the Okhotsk DPS; and the Southern DPS (Boveng et al. 2009). Only the Bering DPS is of concern to the Donlin Gold Project EIS.

Extensive aerial surveys in April through May of 2012 and 2013 encompassed most of the spotted seal breeding area. Analysis of data from 2012 surveys resulted in a mean population estimate of 460,268 spotted seals (Allen and Angliss 2015). Population trend assessments are currently unavailable.

Spotted seals are widely distributed on continental shelf areas of the Beaufort, Chukchi, southeastern East Siberian, Bering, and Okhotsk Seas, and south through the Sea of Japan and the northern Yellow Sea. Habitat use and distribution are closely linked to seasonal sea ice from November/December to March in the Bering Sea. The seals haul out on ice during the whelping, nursing, breeding, and molting periods (Heptner et al. 1976b). Spotted seals congregate on ice floes as the ice begins to disappear in late spring, during which time adults molt and pups are weaned. Adult spotted seals in the Bering Sea molt from late April or early May to mid-July (Boveng et al. 2009). In summer, seals move toward ice-free coastal waters (Heptner et al. 1976a). Spotted seals in the eastern Bering Sea use coastal haul-out sites from Kuskokwim Bay to the Bering Strait from May to July. Among the haulouts used are sandbars near Nanvak Bay in northern Bristol Bay (Quakenbush 1988).

Spotted seals are generalists and eat a varied array of fish, crustaceans, and cephalopods (Dehn et al. 2007). The fish commonly consumed are Pacific herring, smelt, Arctic cod, and saffron cod (Quakenbush et al. 2009).

Spotted seals are important for Alaskan subsistence hunters, primarily in the Bering Strait and Yukon-Kuskokwim regions. The mean annual subsistence harvest in north Bristol Bay from this stock over the 5-year period from 2004 through 2008 was 193 spotted seals per year (Allen and Angliss 2013). In the Kuskokwim region, spotted seals were reported harvested in Quinhagak, Akiak, and Kwethluk (ADF&G 2013 a, 2013b; Coffing et al. 1999).

3.12.4.1.2 CETACEANS

Sightings of cetaceans are rare in the upper Kuskokwim Bay and Kuskokwim River portions of the proposed transportation corridor. Among those with reported sightings in these two areas are beluga whales (*Delphinapterus leucas*), harbor porpoises (*Phocoena phocoena*), and killer whales (*Orcinus orca*). These species also occur in the eastern Bering Sea, along with Dall's porpoises, minke whales, and gray whales.

Beluga Whale (*Delphinapterus leucas*): Eastern Bering Sea Stock

The five stocks of beluga whales recognized in Alaska waters are the Beaufort Sea, eastern Chukchi Sea, eastern Bering Sea, Bristol Bay, and Cook Inlet stocks (Allen and Angliss 2013). Several of these stocks are migratory, with distribution varying seasonally. Recent telemetry data indicate that the Bristol Bay stock of beluga whales is non-migratory and there is no

evidence that members of the stock ever leave Bristol Bay (Citta et al. 2013). The eastern Bering Sea stock is discussed in this section of the EIS, as it includes belugas seen in the Kuskokwim Bay, Kuskokwim River, and Bering Sea transportation corridors.

Systematic line transect surveys of the eastern Bering Sea in 2000 provided the most recent abundance estimate of 28,406 beluga whales in the eastern Bering Sea stock. Although results confirm the large size of the stock, estimates are considered preliminary (Allen and Angliss 2013).

Belugas were common in Kuskokwim Bay during summer until the 1950s when, for unknown reasons, they stopped using the area. Belugas were not reported there again until 1988 and 1989 when groups of 50-200 were seen (Frost et al. 1992). Groups of belugas were also reported in Kuskokwim Bay in July 1994. Although an estimated 500-1,000 were reported, only 8 were seen during an aerial survey (Frost et al. 2002).

Beluga whales have been documented upstream in the Kuskokwim River, although such occurrences are rare. In 1989 and 1990, beluga whales were spotted near Aniak (Coffing 1991). In August 2008, two belugas (presumably a cow and calf) were initially observed by a helicopter crew by the mouth of the Oskawalik River, about 10 miles (16 km) below the village of Crooked Creek, then later verified adjacent to Red Devil (Juneau Empire 2008).

Harbor Porpoise (*Phocoena phocoena*): Bering Sea Stock, Gulf of Alaska Stock

There are currently three stocks of harbor porpoise recognized in Alaska: the Southeast Alaska stock; the Gulf of Alaska stock; and the Bering Sea stock (Allen and Angliss 2013). The latter occurs throughout the Aleutian Islands and all waters north of Unimak Pass and is the stock most likely to occur in or near Kuskokwim Bay and the Kuskokwim River, or near to Dutch Harbor. The Gulf of Alaska stock ranges from Cape Suckling in Prince William Sound to Unimak Pass and could occur in upper Cook Inlet.

The most recent population estimate for the Bering Sea stock is 48,215. This was based on surveys of the Bristol Bay area in 1997 through 1999 (Hobbs and Waite 2010). There is no reliable information on trends in abundance for this stock (Allen and Angliss 2013). The most recent abundance estimate of 31,046 porpoises for the Gulf of Alaska stock is based on surveys conducted in 1998 (Allen and Angliss 2013).

Harbor porpoises in the eastern North Pacific range from Point Barrow and along the west coast of North America from Alaska to Point Conception, California (Gaskin 1984). They are primarily coastal and most commonly occur in waters less than 100 meters (328 feet) deep (Hobbs and Waite 2010). Harbor porpoises are occasionally reported up the Kuskokwim River. A single porpoise observed by field teams near Tuntutuliak in 2008 was the first seen in three years of observations (RWJ Consulting Inc. 2009). Another, albeit dead, was found floating at the river bank in 2009 (RWJ Consulting Inc. 2010b).

Harbor porpoises often feed on bottom-dwelling fishes and small pelagic schooling fishes with high lipid content, such as herring and anchovy (Björge and Tolley 2009, Leatherwood et al. 1982).

Killer Whale (*Orcinus orca*): Alaska Resident Stock and Gulf of Alaska, Aleutian Islands, and Bering Sea Transient Stock

There are three recognized ecotypes of killer whales—resident, transient, and offshore—distinguished by morphology, ecology (including prey), genetics, acoustics, and behavior (Baird and Stacey 1988, Baird et al. 1992, Ford and Fisher 1982, Hoelzel and Dover 1991, Hoelzel et al. 1998, 2002). Within these ecotypes are six identified stocks of killer whales in Alaska: the Alaska Resident stock (southeastern Alaska to the Aleutian Islands and Bering Sea); the Northern Resident stock (British Columbia through part of southeastern Alaska); the Gulf of Alaska, Aleutian Islands, and Bering Sea Transient stock (mainly from Prince William Sound through the Aleutian Islands and Bering Sea); the AT1 transient stock (Prince William Sound through the Kenai Fjords); the West Coast transient stock (California through southeastern Alaska); and the Offshore stock (California through Alaska) (Allen and Angliss 2013).

The Alaska Resident stock and the Gulf of Alaska, Aleutian Islands, and Bering Sea Transient stock are those most likely to occur in the Donlin Gold Project Area. Members of the Alaska Resident stock have been photographically identified in Southeast Alaska, Prince William Sound, and western Alaska, with recently documented movements between the Bering Sea and Gulf of Alaska. Combining counts of known ‘resident’ whales from these areas provides a minimum of 2,084 killer whales belonging to the Alaska Resident stock (Allen and Angliss 2013). The minimum population estimate for the Gulf of Alaska, Aleutian Islands, and Bering Sea transient stock is 552, based on photographic identification of individuals (Allen and Angliss 2013). Data are currently not available for determining trends in abundance.

Killer whales are found in all oceans and most seas in coastal and temperate waters of high productivity (Forney and Wade 2006). Killer whales range throughout the North Pacific and from Alaska to California along the west coast of North America. The distribution and frequency of killer whales in Kuskokwim Bay is little studied and there are no documented cases of killer whales in the Kuskokwim River (Frost et al. 1992). There were multiple sightings of killer whales in Bristol Bay and Kuskokwim Bay in the summers of 1989 and 1990. In August 1989, a group of 35 killer whales were seen between the mouth of the Kuskokwim River and Quinhagak. One dead killer whale was in the same area in 1990; no live whales were seen that year. The 1989 sightings in Kuskokwim Bay were the first documented in that area (Frost et al. 1992). Resident killer whales were abundant around Unalaska Island (where Dutch Harbor is located) during surveys conducted in July and August of 2001-2003 (Zerbini et al. 2007).

Killer whales are apex marine predators with a diverse prey base. Transient killer whales are mammal-hunters whose prey includes various seal species. Residents are generally considered fish-eaters (Ford 2009). The killer whales observed in Kuskokwim Bay in 1989 were interacting with salmon, harbor seals, Steller sea lions, walruses, and belugas (Frost et al. 1992).

Dall's Porpoise (*Phocoenoides dalli*): Alaska Stock

Stock structure of eastern North Pacific Dall's porpoise populations is not well understood. The Alaska stock is currently the only stock of Dall's porpoise recognized in Alaska waters where it occurs in the Gulf of Alaska, Bering Sea, and Aleutian Islands areas. Estimated abundance for the Alaska stock was 83,400 porpoises (Allen and Angliss 2013).

Dall's porpoises only occur in the North Pacific and adjacent seas and are probably the most widely distributed cetacean in temperate and subarctic regions of the North Pacific Ocean and

Bering Sea. This is an oceanic species found along the continental shelf and in inland and coastal waters of the Gulf of Alaska and Bering Sea/Aleutian Islands areas. There are seasonal inshore-offshore and north-south movements, but these movements are poorly understood (Jefferson 2009). Dall's porpoises are not common in Kuskokwim Bay or Kuskokwim River, but are common in deeper waters of the eastern Bering Sea (Moore et al. 2002, Friday et al. 2013).

Minke Whale (*Balaenoptera acutorostrata*): Alaska Stock

The two stocks of North Pacific minke whales recognized in U.S. waters are the Alaska stock and the California/Washington/Oregon stock (Allen and Angliss 2013). The Alaska stock is included here.

There are no abundance estimates for minke whales in the entire North Pacific or for the Alaska stock. Provisional estimates exist for minke whales in the central-eastern (810) and southeastern (1,003) Bering Sea (Moore et al. 2002). These numbers include only part of the stock's range, so cannot be extrapolated out to the entire stock. There are no data on abundance trends in Alaska waters (Allen and Angliss 2013).

Minke whales are among the most common and numerous baleen whales found throughout the world. In the Northeast Pacific Ocean, they range from the Chukchi Sea south to Baja California (Perrin and Brownell 2009). Distribution in the southeastern Bering Sea is variable (Friday et al. 2013). Common prey in the North Pacific includes euphausiids, anchovies, Pacific saury, walleye pollock, small fish, and squid (Perrin and Brownell 2009).

Gray Whale (*Eschrichtius robustus*): Eastern North Pacific Stock

The two stocks of gray whales in the North Pacific are the eastern North Pacific stock that migrates along the coasts of eastern Siberia, North America (including Alaska), and Mexico, and the western North Pacific stock that migrates primarily between the South China Sea and the Okhotsk Sea (Carretta et al. 2013). Although individuals from the western North Pacific stock may occasionally migrate to the eastern Pacific (Mate et al. 2011, Weller et al. 2012), the eastern North Pacific stock is the only one considered here.

The eastern North Pacific gray whale population has been increasing over the past several decades. The most recent population estimate was 19,126 in 2006-2007 (Laake et al. 2009). Buckland and Breiwick (2002) estimated a population increase of 2.5 percent per year between 1967-1968 and 1995-1996, while Rugh et al. (2005) used more recent survey data to estimate a 1.9 percent rate of increase from 1967-1968 through 2001-2002. The steadily increasing population abundance warranted delisting of the eastern North Pacific gray whale stock in 1994, as it was no longer considered endangered or threatened under the ESA (Rugh et al. 1999).

The summer feeding range for eastern North Pacific gray whales extends from California to the Arctic. Most feeding occurs in the northern and western Bering and Chukchi seas. Gray whales primarily occur in the southeastern Bering Sea and in the vicinity of Unimak Pass and Unalaska Island during migration between high-latitude feeding areas and breeding lagoons in Mexico (Rugh et al. 1999). The southward migration out of the Chukchi Sea generally begins during October and November, passing through Unimak Pass in November and December. The northward migration usually begins in mid-February and continues through May, with whales entering the southern Bering Sea through Unimak Pass starting in April (Rice et al. 1984).

Gray whales are the most coastal of all the large whales and inhabit primarily inshore or shallow, offshore continental shelf waters (Jones and Swartz 2009). Gray whales are suction-feeders and prey primarily on benthic amphipods, decapods, and other invertebrate species.

3.12.4.1.3 PROTECTED SPECIES

All marine mammals are federally protected under the MMPA of 1972. The FWS has jurisdiction over Pacific walrus, sea otters, polar bears, and manatees; the remainder is under the jurisdiction of NMFS. In addition, several species found in the Bering Sea, along coastal western Alaska, and in Cook Inlet are listed under the ESA. Endangered whale species in the Bering Sea include fin whales (*Balaenoptera physalus*), humpback whales (*Megaptera novaeangliae*), and North Pacific right whales (*Eubalaena japonica*); the occurrence of which in Kuskokwim Bay and the vicinity of the proposed water-based transportation corridor is rare. Listed pinnipeds found in the area include the western stock of Steller sea lions (*Eumetopias jubatus*), which is listed as endangered, and ringed (*Phoca hispida*) and bearded seals (*Erignathus barbatus*), which are listed as threatened. Pacific walrus (*Odobenus rosmarus divergens*) is a candidate species for listing under the ESA. The endangered Cook Inlet stock of beluga whales (*Delphinapterus leucas*) commonly occurs in upper Cook Inlet and in the vicinity of the Beluga barge landing and near Tyonek. Individuals of the western stock of Steller sea lions occasionally occur in upper Cook Inlet. By default, all species listed under the ESA as threatened or endangered are also considered depleted under the MMPA. Threatened and endangered marine mammal species are further discussed in Section 3.14, Threatened and Endangered Species.

3.12.4.1.4 CLIMATE CHANGE

Climate change is affecting resources in the EIS Analysis area and trends associated with climate change are projected to continue into the future. Section 3.26.2 (Climate Change) discusses climate change trends and impacts to key resources in the physical and biological environments including atmosphere, water resources, permafrost, and vegetation. Current and future effects on marine mammals are tied to changes in physical resources and vegetation (discussed in Section 3.26.3).

3.12.4.2 ENVIRONMENTAL CONSEQUENCES

Table 3.12-10 indicates the mechanisms by which effects of the alternatives on marine mammals can be systematically assessed. This table summarizes criteria for determining the impact level based on intensity (magnitude), duration, extent, and context. Criteria were developed for biological resources, and can be applied to multiple species, including marine mammals. In general, available data are insufficient for quantitative analyses of effects on marine mammals; criteria and determinations are, therefore, necessarily more qualitative. Effects summaries per component and effect inform summary impact levels that range from negligible to major; no effect is also possible.

Table 3.12-10: Impact Criteria for Effects on Marine Mammals

Type of Effect	Impact Component	Effects Summary		
Behavioral Disturbance	Magnitude or Intensity	Low: Changes in behavior due to project activity may not be noticeable; animals remain in the vicinity.	Medium: Noticeable change in behavior due to project activity that may affect reproduction or survival of individuals.	High: Acute or obvious/abrupt change in behavior due to project activity; life functions are disrupted; animal populations are reduced in the EIS Analysis Area.
	Duration	Temporary: Behavior patterns altered infrequently, but not longer than the span of Project construction and would be expected to return to pre-activity levels after actions causing impacts were to cease.	Long-term: Behavior patterns altered for several years and would return to pre-activity levels long-term (from the end of construction through the life of the mine, and up to 100 years) after actions causing impacts were to cease.	Permanent: Change in behavior patterns would continue even if actions that caused the impacts were to cease; behavior not expected to return to previous patterns.
	Geographic Extent	Local: Impacts limited geographically; limited to vicinity of the Project Area or a subset.	Regional: Affects resources beyond a local area, potentially throughout the EIS Analysis Area.	Extended: Affects resources beyond the region or EIS Analysis Area.
	Context	Common: Affects usual or ordinary resources in the EIS Analysis Area; resource is not depleted in the locality or protected by legislation.	Important: Affects depleted resources within the locality or region or resources protected by legislation.	Unique: Resources protected by legislation and the portion of the resource affected fills a unique ecosystem role within the locality or region.
Habitat Alterations	Magnitude or Intensity	Low: Changes in resource character or quantity may not be measurable or noticeable.	Medium: Noticeable changes in resource character and quantity.	High: Acute or obvious changes in resource character and quantity.
	Duration	Temporary: Resource would be reduced infrequently but not longer than the span of 1 year and would be expected to return soon to pre-activity levels.	Long-term: Resource would be reduced for up to the life of the project and would return to pre-activity levels long-term (from the end of construction through the life of the mine, and up to 100 years) after that.	Permanent: Resource would not be anticipated to return to previous character or levels.

Table 3.12-10: Impact Criteria for Effects on Marine Mammals

Type of Effect	Impact Component	Effects Summary		
	Geographic Extent	Local: Impacts limited geographically; limited to vicinity of the Project Area.	Regional: Affects resources beyond a local area, potentially throughout the EIS Analysis Area.	Extended: Affects resources beyond the region or EIS Analysis Area.
	Context	Common: Affects usual or ordinary resources in the EIS Analysis Area; resource is not depleted in the locality or protected by legislation.	Important: Affects depleted resources within the locality or region or resources protected by legislation.	Unique: Resources protected by legislation and the portion of the resource affected fills a unique ecosystem role within the locality or region.
Injury and Mortality	Magnitude or Intensity	Low: No noticeable incidents of injury or mortality; population level effects not detectable.	Medium: Incidents of injury or mortality are detectable; populations remain within normal variation.	High: Incidents of mortality or injury create population-level effects.
	Duration	Temporary: Events with potential for mortality or injury would occur for a brief, discrete period lasting less than one year, or up to the duration of the construction phase.	Long-term: Events with potential for mortality or injury would continue for up to the life of the project.	Permanent: Potential for mortality or injury would persist after actions that caused the disturbance ceased.
	Geographic Extent	Local: Impacts would be limited to vicinity of the Project Area or subsets.	Regional: Impact would occur beyond a local area, potentially throughout the EIS Analysis Area.	Extended: Impacts would occur beyond the region or EIS Analysis Area.
	Context	Common: Affects usual or ordinary resources in the EIS Analysis Area; resource is not depleted in the locality or protected by legislation.	Important: Affects depleted resources within the locality or region or resources protected by legislation.	Unique: Resources protected by legislation and the portion of the resource affected fills a unique ecosystem role within the locality or region.

3.12.4.2.1 ALTERNATIVE 1 – NO ACTION

Under the No Action Alternative, there would be no mine site development, no transportation facilities, and no natural gas pipeline. Therefore, there would be no project-related impacts to marine mammals in the Donlin Gold Project EIS Analysis Area.

3.12.4.2.2 ALTERNATIVE 2 – DONLIN GOLD'S PROPOSED ACTION

Potential Impacts

The Donlin Gold Project components most likely to impact marine mammals are the marine and riverine portions of the transportation facilities, and barging and nearshore activity in upper Cook Inlet. Direct and indirect effects could include injury or mortality through vessel strikes, behavioral disturbance or displacement due to noise, and habitat changes and/or injury or mortality through contamination from fuel or chemical spills. Effects of barge trips south of Dutch Harbor or Cook Inlet are not analyzed because they are a small fraction of the typical shipping traffic to and from the Dutch Harbor vicinity and are within the range of variability of that shipping background. The following general discussion of potential effects provides background for more specific analysis relevant to the project components and phases in the sections that follow.

Potential Injury and Mortality—Vessel Strikes

Collisions between marine mammals and ships occur worldwide, with vessel speed being a key determinant of the frequency and severity of ship strikes. The potential for vessel collisions with marine mammals increases with ship speeds of 15 knots and greater (Laist et al. 2001; Vanderlaan and Taggart 2007). The potential for vessel strikes in the Kuskokwim River and at the mouth of the river would be minimized by the relatively slow speed at which tugs and barges are expected to travel in that portion of the Project Area. River barges for cargo travelling to or from the Bethel Port are expected to average 4 knots upriver while loaded and 10 knots downriver when empty. Similarly, the average speed of fuel barges would be 3.5 knots while loaded and travelling upriver and 10 knots downriver and empty. The transit speed of the fuel and cargo tugs and barges travelling between Dutch Harbor and the mouth of the Kuskokwim River should be in the 10 knot (or slower) range and, thus, below the speed threshold above which the potential for and severity of collisions increase.

Potential Impacts of Noise

The three types of potential impacts of noise on marine mammals are non-auditory injury, auditory injury, and behavioral (e.g., avoidance, changes in foraging or social behavior) (Richardson et al. 1995; Southall et al. 2007). Behavioral impacts from vessel traffic noise and dock and port construction noise are most likely. In-water noise from vessels, sonar, construction, or other sources could interfere with or mask marine mammal communication or cause deflection from or avoidance of an area (Clark et al. 2009; David 2006; Norman 2011; Tougaard et al. 2009; Würsig et al. 2000). Injury from noise is not likely, as sound levels are all expected to be well below injury thresholds.

Marine mammals are known to react to vessel activity and noise. Whales react less dramatically to the noise from slow-moving vessels than to faster and/or erratic vessel movements and engine noises. Some species tolerate slow-moving vessels within several hundred yards, especially if there are no sudden changes in direction or engine speed (Heide-Jorgensen et al. 2003; Richardson et al. 1995; Wartzok et al. 1989). Behavioral responses to vessels vary by vessel size, speed, distance, and whale species, but may include avoidance, such as swimming away from the vessel, or changes in diving and surfacing behavior (Finley et al. 1984; Norman 2011).

Pinnipeds are sensitive both to sound in air and in water and may be susceptible to loud noise when they are in the water or hauled out on land (Kastek et al. 2005). Most available information on reactions of pinnipeds to boats concern pinnipeds hauled out on land or ice. Human-caused disturbances of hauled-out seals usually result in flushing animals into the water (Jansen et al. 2006; Suryan and Harvey 1999). Harbor seals are more dependent on haulouts during pupping (early June through early July at Nanvak Bay) and molting (late August and early September at Nanvak Bay), leaving them more vulnerable to disturbance at those times. Harbor seals flushed from haulouts in Nanvak Bay have been known to alter haulout patterns for up to a day after disturbance (MacDonald and Winfree 2008). In places where boat traffic is heavy, seals may habituate to vessel disturbance (e.g., Bonner 1982; Jansen et al. 2006). The relatively low occurrence of marine mammals and lack of observed pinniped haulout sites in the Kuskokwim River, the mouth of the river, and in upper Cook Inlet suggests minimal likelihood of disturbance from vessel noise.

Contamination and Fuel Spills

Marine mammals could potentially be exposed to discharges and spills from vessels transporting fuel and cargo, as well as to fuel spilled at any of several transfer points, including barge to storage tank transfer or ocean barge to river barge transfer at the Bethel Port site, and river barge to storage tank transfer at the Angyaruaq (Jungjuk) Port site, or in the event of a stranded barge that requires lightering of fuel.

Section 3.24, Spill Risk, provides analysis of risks and potential impacts of spills from fuel barges and storage tanks along the marine and riverine transportation corridors, and from tanker trucks traveling to and from the mine site. The risk of catastrophic accidents is very small (likelihood of occurrence is low during the life of the project), although small accidents and spills could periodically occur. The severity of impacts would depend on the type of contaminant spilled, the volume and extent of the spill, time and location of a spill, and whether or not marine mammals are present.

Climate Change Summary for Alternative 2

Predicted overall increases in temperatures and precipitation and changes in the patterns of their distribution (McGuire 2015; Chapin et al. 2006, 2010; Walsh et al. 2005) have the potential to influence the projected effects of the Donlin Gold Project marine mammal habitat. Changes in marine productivity could negatively affect food webs. Impacts of climate change to threatened and endangered marine mammals are extremely complex and poorly understood at this time. See Section 3.26, Climate Change, for details on affected environment for resources. See Section 3.26 (Climate Change) for further details on climate change and resources.

Mine Site — Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

Any direct or indirect effects on marine mammals incurred during construction, operations, or closure of the mine site would be due to transportation of fuel and materials via barges or construction at the port sites. These are discussed above under Potential Impacts and below under Transportation Facilities. Therefore, there would be no direct or indirect effects of the mine site component of Alternative 2 on marine mammals.

Transportation Facilities — Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

The Donlin Gold Project components most likely to impact marine mammals are the marine and riverine portions of the transportation facilities, and barging and nearshore activity in upper Cook Inlet.

Direct and Indirect Effects from Construction

There are two construction components to consider when discussing potential impacts to marine mammals. One is construction of specific transportation facilities (i.e., at the Bethel cargo terminal, fuel terminal, and tank farm, and the Angyaruaq [Jungjuk] Port site). The other involves shipping and offloading cargo and fuel during construction of the mine site and natural gas pipeline.

Dock construction at the port sites would involve pile driving (sheet pile). The high amplitude noise from pile driving activities may mask marine mammal vocalizations or cause deflection or avoidance of an area (David 2006; Tougaard et al. 2009; Würsig et al. 2000). Studies of large-scale offshore pile driving suggest audibility by harbor seals depends on propagation conditions and background noise, but could be up to great distances from the sound source (Kastelein et al. 2013). The distance of effects would be much more localized in a river where channels are of limited width and the channels bend. Noise would likely result in some level of temporary and localized displacement or avoidance of the area by marine mammals during pile driving and dock construction activities (Dahne et al. 2013; Kendall 2010). The frequency of occurrence of seals in either port area is, however, relatively low (very low at Angyaruaq (Jungjuk) Port), and harbor porpoise, beluga whale, and killer whale sightings are rare, limiting the likelihood that individuals would be disturbed by construction noise. During mine construction, supplies will be transported by ocean-going and river barges during the 110-day ice-free shipping season from approximately June 1 to October 1. Ocean-going cargo barges would make 16 round trips to Bethel during the shipping season during the construction phase. Transport from Bethel to the Angyaruaq (Jungjuk) Port site would be on river barges. The river cargo barge fleet, comprised of two single-hull pusher tugs with four river barges each, would operate daily during the shipping season, for a total of 64 round trips per season.

Potential effects on seals and cetaceans during the construction phase may include temporary, short-term displacement during construction at the Bethel Port site and behavioral disturbance or displacement caused by vessel traffic delivering fuel and cargo transport to Bethel and upriver to the Angyaruaq (Jungjuk) Port site. Although gray whales occur in the eastern Bering Sea, they are generally only there during migration prior to and after the proposed shipping season, so they are unlikely to be encountered or impacted by vessel traffic between Dutch Harbor and Bethel. Other cetaceans along the Bering Sea barge corridor (minke whales, killer whales, harbor porpoises, Dall's porpoises) could be encountered during cargo and fuel transport and could experience temporary displacement or avoidance as ships pass by. Some, such as Dall's porpoise, however, often approach fast moving vessels to ride the bow wave. The nearest major harbor seal haulout and pupping area is in Nanvak Bay in northern Bristol Bay and outside of the Donlin Gold Project Area, so large scale disturbance of sensitive habitat and life stages is unlikely. Seals in the Kuskokwim River are generally in small groups of one to two animals and in the water resting, traveling, or foraging, and are, thus, less susceptible to disturbance than seals hauled out on land. Given the low likelihood that barges traveling between Dutch Harbor and Bethel would affect marine mammals beyond periodic, temporary

displacement, the infrequent sightings of very small numbers of individual cetaceans, and the lack of major pinniped haulout sites in or near the Kuskokwim River, the variability in occurrence, and general low occurrence of seals in the Kuskokwim River and river mouth, any effects on marine mammals due to construction activities would be of low intensity, temporary, and localized to areas where activities and marine mammals, primarily seals, may co-occur.

Direct and Indirect Effects from Operations and Maintenance

Shipping activity during the operations phase of the mine site would occur during the ice-free season from about June 1 to October 1. The number of vessels and frequency of operation during this project component would differ slightly from that during the construction phase, but the potential effects would be similar. Details specific to operations are noted here.

During the estimated 110-day shipping season, ocean cargo barges would complete 12 round trips between Dutch Harbor marine terminals and the Bethel Port site. In addition, fuel will be transported from Dutch Harbor to Bethel in a double-hull 2.94 Mgal capacity ocean barge and off-loaded at the tank farm for storage or a river barge for transport. There would be 14 such fuel delivery trips per season. The river barges for cargo are expected to make 32 round trips per barge tow (one tow includes one single-hulled tug and four barges) per season for a total of 64 round trips or just over a half a trip per day between the Bethel and Angyaruaq (Jungjuk) Port sites. Each river fuel barge-tow is anticipated to make 29 round trips between Bethel and Angyaruaq (Jungjuk) Port per barge per season, for a total of 58 round trips per season. Total combined fuel and cargo barge trips between Dutch Harbor and Bethel Port site would be 26 per season. Total combined fuel and cargo barge trips between the Bethel Port site and the Angyaruaq (Jungjuk) Port site on the Kuskokwim River would be 122 round trips per 110 day season.

This increased level of barge traffic in the Kuskokwim River would increase underwater noise levels and the potential for behavioral disturbance of individual marine mammals in the area, such as short-term disturbance or temporary displacement as the barge passes by. The frequency of occurrence of pinnipeds in the lower Kuskokwim River (11-68 sightings of harbor/spotted seals per year, 2007-2009) is both variable and oftentimes low, minimizing the likelihood of repeated co-occurrence with barge traffic. Harbor porpoises and belugas are rare in the Kuskokwim River, and killer whales have never been seen in the river, although they are occasionally sighted in Kuskokwim Bay, so the likelihood of disturbance is low. Given the slow speed at which the barges would travel and the engine noise, marine mammals would likely anticipate approaching vessels with adequate time to move out of harm's way and avoid collisions. Therefore, anticipated effects of transportation facilities during the operations phase of the mine site on non-threatened and endangered marine mammals would be of low intensity, temporary, and localized for both potential behavioral disturbance and injury.

Direct and Indirect Effects from Closure, Reclamation, and Monitoring

Direct and indirect effects on marine mammals incurred during closure of transportation facilities would likely be similar to effects described above for the construction and operations phases and be largely attributed to transportation of fuel and materials via barges, and dismantling of the barge landing at the Angyaruaq (Jungjuk) Port site. Noise generated during removal of the barge landing would likely be of lower amplitude than during dock construction and of shorter duration. The number and frequency of barge trips hauling materials down river would also be lower than during either the construction or operation phases. Potential effects

from vessel traffic and material and fuel transport are as discussed above. With the lower activity level and shorter time period, potential effects on marine mammals would likely include behavioral disturbance and be of low intensity, temporary duration, and localized to areas of reclamation and points along the river where barges and seals may occasionally co-occur.

Natural Gas Pipeline — Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

Direct or indirect effects on non-ESA-listed marine mammals incurred during construction, operations, and closure of the natural gas pipeline would primarily be due to transportation of pipe and supplies via barges in the Kuskokwim River transportation corridor and in upper Cook Inlet (Beluga barge landing). Potential effects would, therefore, be similar to those discussed above under Transportation Facilities and under general Potential Effects. Effects on marine mammals would be of low intensity, temporary, and localized to areas where activities and marine mammals, primarily seals, may co-occur.

Overall Conclusion – Alternative 2

Direct and indirect effects of Alternative 2 on non-threatened or non-endangered marine mammals would derive primarily from port site in-water construction and fuel and cargo barge traffic. Injury and mortality are unlikely given the slow vessel speed during river travel and the low occurrence of marine mammals in the Kuskokwim River portion of the Project Area. Gray whales are not likely to occur in the Project Area during the June 1 to October 1 shipping season, and faster moving cetaceans in the barge corridor (primarily Dall's porpoises and killer whales) could readily maneuver around cargo and fuel barges travelling between Dutch Harbor and Bethel. Few non-threatened or non-endangered marine mammals commonly occur in the vicinity of the Beluga barge landing in upper Cook Inlet. Harbor seals are seen in the vicinity of nearby rivers, such as the Beluga River, during summer months but numbers are highly variable. Contamination from fuel spills would be minimized through adherence to numerous federal and state regulations mitigating spill risk and clean-up, including the project's Spill Prevention, Control, and Countermeasure (SPCC) Plan. Potential effects would, therefore, primarily involve behavioral disturbance. Anticipated effects, summarized in Table 3.12-11, would be of low intensity (no noticeable or lasting change in behavior; displacement, were it to occur, would be temporary; and reproduction or survival would not be compromised), temporary in duration (displacement or behavioral changes would only occur during brief periods as barges pass by or for the period of in-water construction noise), and local in extent (disturbance would only occur in specific locations where construction or barge traffic coincide with individual marine mammals). All marine mammals, including those not listed under the ESA, are protected under the MMPA and are, therefore, considered important in context. The direct and indirect effects of Alternative 2 on non-threatened or non-endangered marine mammals would be negligible to minor.

Table 3.12-11: Summary of Effects on Marine Mammals from Alternative 2 by Impact Type and Project Component

Impact Type	Impact Level by Factor				
	Magnitude or Intensity	Duration	Geographic Extent	Context	Summary Impact Rating ¹
Mine Site: no direct or indirect effects of this component on marine mammals (see Transportation)					
Transportation Infrastructure					
Behavioral Disturbance	Low	Temporary	Local	Important (MMPA protection)	Negligible to minor
Injury and Mortality	Low	Temporary to long-term (ship traffic will continue for life of project, but use of barge corridors is periodic, not continuous)	Local	Important (MMPA protection)	Negligible to minor
Contamination and Fuel Spills	Low (numerous regulations, emergency response procedures)	Temporary to Long-term	Local to Regional	Important (MMPA protection)	Minor
Pipeline: Impacts related to transportation during the construction phase (see Transportation)					

Notes:

1 The summary impact rating accounts for impact reducing design features proposed by Donlin Gold and Standard Permit Conditions and BMPs that would be required. It does not account for additional mitigation measures the Corps is considering.

These effects determinations take into account impact reducing design features (Table 5.2-1 in Chapter 5, Impact Avoidance, Minimization, and Mitigation) proposed by Donlin Gold and also the Standard Permit Conditions and BMPs (Section 5.3, Chapter 5, Impact Avoidance, Minimization, and Mitigation) that would be implemented. Several examples of these are presented below.

Design features most important for reducing impacts to marine mammals include:

- Ocean and river fuel barges would be double hulled and have multiple isolated compartments for transporting fuel to reduce the risk of a spill.
- The barge operations system was designed to avoid the need for river dredging.
- Barges would travel at 10 knots or less.

Standard Permit Conditions and BMPs most important for reducing impacts to marine mammals include:

- Development and maintenance of ODPCPs and SPCC Plans, and
- Preparation of a Wildlife Avoidance and Human Encounter/Interaction Plan.

Additional Mitigation and Monitoring for Alternative 2

While the Corps is considering additional mitigation and monitoring to reduce the effects presented above (Tables 5.5-1 and 5.7-1 in Chapter 5, Impact Avoidance, Minimization, and Mitigation), no additional mitigation or monitoring measures have been identified to reduce effects to marine mammals. Thus, the summary impact rating for marine mammals would remain negligible to minor.

3.12.4.2.3 ALTERNATIVE 3A – REDUCED DIESEL BARGING: LNG-POWERED HAUL TRUCKS

Mine Site — Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

There are no proposed changes to the mine site locations or operations under this alternative. Potential impacts on marine mammals are, therefore, as described above under Alternative 2.

Transportation Facilities — Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

Direct and Indirect Effects from Construction

The decreased diesel fuel use under this alternative would likely not require the increased storage capacity at either Dutch Harbor or Bethel that was proposed under Alternative 2. Diesel storage capacity at Angyaruaq (Jungjuk) Port would also be reduced. Reduced or eliminated need for storage would mean reduced or eliminated construction needs at these ports and reduced potential for construction-related disturbance of marine mammals.

Direct and Indirect Effects from Operations and Maintenance

Alternative 3A differs from Alternative 2 by a substantial decrease in the number of ocean and river fuel barge trips. Trips between Dutch Harbor and Bethel would decrease from 14 under Alternative 2 to 5 under Alternative 3A. Finally, the number of river fuel barge trips between Bethel and Angyaruaq (Jungjuk) Port would decrease from 58 trips per season to 19 trips. The combined fuel and cargo river barge trips would, therefore, decrease from 122 trips per season to 83 trips. Fewer fuel barge trips would decrease the potential for vessel disturbance of marine mammals in the Kuskokwim River and in the Dutch Harbor to Bethel barge corridor. The number of cargo trips would be the same as under Alternative 2.

Direct and Indirect Effects from Closure, Reclamation, and Monitoring

Effects from closure under Alternative 3A would be the same as under Alternative 2.

Natural Gas Pipeline — Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

Construction, operations, and closure of the natural gas pipeline under Alternative 3A would essentially be the same as under Alternative 2. Potential effects on marine mammals would, therefore, be the same as under Alternative 2.

Overall Conclusion - Alternative 3A

Direct and indirect effects of Alternative 3A on non-threatened or endangered marine mammals would be very similar to Alternative 2 and derive primarily from port site in-water construction and fuel and cargo barge traffic. Decreased fuel barging and construction needs would, however, reduce potential impacts associated with vessel traffic between Dutch Harbor and Bethel and at the mouth of and in the Kuskokwim River from that anticipated under Alternative 2. Potential effects would similarly primarily involve behavioral disturbance and be of low intensity (no noticeable or lasting change in behavior), temporary in duration (displacement or behavioral changes would only occur during brief periods as barges pass by or for the period of in-water construction noise), and local in extent (disturbance would only occur in specific locations where construction or barge traffic coincide with individual marine mammals). All marine mammals, including those not listed under the ESA, are protected under the MMPA and are, therefore, considered important in context. Impacts associated with climate change would also be the same as those discussed for Alternative 2. The direct and indirect effects of Alternative 3A on non-threatened or endangered marine mammals would be negligible.

The effects determinations take into account applicable impact reducing design features and BMPs, as discussed in Alternative 2. No additional mitigation or monitoring measures have been identified to reduce effects to marine mammals. Thus, the summary impact rating for marine mammals would remain negligible to minor.

3.12.4.2.4 ALTERNATIVE 3B – REDUCED DIESEL BARGING: DIESEL PIPELINE

Mine Site — Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

The infrastructure at the mine site would be similar to Alternative 2, except that there would be additional diesel storage tanks. Potential impacts on marine mammals under Alternative 3B would, therefore, be as described above under Alternative 2.

Transportation Facilities — Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

Direct and Indirect Effects from Construction

Transportation facilities for cargo shipments, such as docks in Bethel and Angyaruaq (Jungjuk) Port would be the same as under Alternative 2. The diesel storage capacity in Dutch Harbor, Bethel, and at Angyaruaq (Jungjuk) Port would not, however, be required for Alternative 3B. Specific to Alternative 3B would be required improvements to the Tyonek North Foreland Barge Facility to accommodate vessels in excess of 30,000 gross tons and construction of fuel unloading facilities capable of accommodating the proposed volume of diesel fuel. The dock would need to be extended an additional 1,500 feet, including driving piles to support it. Dredging would not be required, as the dock would be extended out to the desired water depth. Effects of activities associated with dock expansion at Tyonek and construction at the Bethel and Angyaruaq (Jungjuk) Port sites would be similar to that described under Alternative 2—possible temporary, localized, low-intensity behavioral disturbance to the low numbers of non-threatened or endangered marine mammals that may occur in these areas.

Direct and Indirect Effects from Operations and Maintenance

Alternative 3B would decrease peak annual Donlin Gold Project barge traffic on the Kuskokwim River between Bethel and the Angyaruaq (Jungjuk) Port site to 64 trips for cargo transit only. This is down from an estimated 122 river barge trips per season under Alternative 2. Cargo transport between marine terminals and Bethel would be similar to Alternative 2, with 16 round trips per season during the construction phase and 12 during the operations phase. Under Alternative 3B, there would be 12 round trips per season to transport fuel from either marine terminals in the Pacific Northwest or from the Tesoro Refinery in Nikiski to Tyonek. Halving the amount of barge traffic on the Kuskokwim River would decrease the likelihood of potential interactions with marine mammals in the river. Additional vessel traffic into Tyonek would increase the potential for disturbance or collisions as described under Alternative 2, Transportation Facilities. The frequency of occurrence of non-threatened or endangered marine mammals such as harbor seals is, however, low in that area. Potential effects would likely be temporary (for the duration of a barge passing by), localized (in the vicinity of vessel traffic), and of low-intensity (some behavioral modifications may occur, but are not likely to exceed short-term avoidance).

Direct and Indirect Effects from Closure, Reclamation, and Monitoring

Effects from closure under Alternative 3B would be the same as under Alternative 2.

Diesel Pipeline — Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

Direct and Indirect Effects from Construction

Construction at the existing dock at the Tyonek North Foreland Facility would involve extension to deeper water. The diesel pipeline would also require a 19-mile extension from the proposed end of the natural gas pipeline to Tyonek, which would cross the Beluga River. Most potential impacts from construction would result from the dock extension and vessel traffic from materials transport. Effects of construction would be similar to that described under Alternative 2—possible temporary, localized, low-intensity behavioral disturbance of the low numbers of non-threatened or endangered marine mammals in the area.

Direct and Indirect Effects from Operations and Maintenance

The potential impacts on marine mammals during the operations phase of the diesel pipeline would be during fuel transport to the dock at Tyonek. Therefore, effects would be as described above under Transportation Facilities.

In addition to potential impacts from barge traffic, is the potential for fuel spills during delivery. This is further discussed under Section 3.24, Spill Risk.

Direct and Indirect Effects from Closure, Reclamation, and Monitoring

Effects from closure under Alternative 3B would be the same as under Alternative 2.

Overall Conclusion – Alternative 3B

The types of direct and indirect effects of Alternative 3B on non-threatened or endangered marine mammals would be very similar to Alternative 2 and derive primarily from port site in-water construction and fuel and cargo barge traffic. Greatly reduced fuel barge traffic and construction needs in the Kuskokwim River and between Dutch Harbor and Bethel would, however, reduce potential impacts associated with vessel traffic in those areas from that anticipated under Alternative 2. Few non-threatened or endangered marine mammals regularly occur in the vicinity of the Tyonek dock in Upper Cook Inlet. Harbor seals may occur at the mouths of nearby rivers, including the Beluga River, during summer months, but numbers are highly variable. Potential effects would primarily involve behavioral disturbance and be of low intensity (no noticeable or lasting change in behavior), temporary in duration (displacement or behavioral changes would only occur during brief periods as barges pass by or for the period of in-water construction noise), and local in extent (disturbance would only occur in specific locations where construction or barge traffic coincide with individual marine mammals). All marine mammals, including those not listed under the ESA, are protected under the MMPA and are, therefore, considered important in context. Impacts associated with climate change would also be the same as those discussed for Alternative 2. The direct and indirect effects of Alternative 3B on non-threatened or endangered marine mammals would be negligible.

The effects determinations take into account applicable impact reducing design features and BMPs, as discussed in Alternative 2. No additional mitigation or monitoring measures have been identified to reduce effects to marine mammals. Thus, the summary impact rating for marine mammals would remain negligible to minor.

3.12.4.2.5 ALTERNATIVE 4 – BIRCH TREE CROSSING PORT

Under Alternative 4, the port facility would be located at Birch Tree Crossing, which is located approximately 60 miles downstream from the Angyaruaq (Jungjuk) Port site proposed under Alternative 2. This would reduce the barge distance for freight and diesel out of Bethel bound for the mine site, thereby eliminating impacts on marine mammals upstream of Birch Tree Crossing. Impacts associated with climate change would also be the same as those discussed for Alternative 2. Since the occurrence of harbor seals at either port site is low, the change in port location would not change the overall level of impacts on marine mammals from that described above under Alternative 2. The effects determinations take into account applicable impact reducing design features and BMPs, as discussed in Alternative 2. No additional mitigation or monitoring measures have been identified to reduce effects to marine mammals. Thus, the summary impact rating for marine mammals would remain negligible to minor.

3.12.4.2.6 ALTERNATIVE 5A – DRY STACK TAILINGS

Because the activities of Alternative 5A in the areas where marine mammals would occur would be the same as those of Alternative 2, the potential direct and indirect impacts on marine mammals under Alternative 5A would be the same as described above under Alternative 2. Impacts associated with climate change would also be the same as those discussed for Alternative 2. The effects determinations take into account applicable impact reducing design features and BMPs, as discussed in Alternative 2. No additional mitigation or monitoring

measures have been identified to reduce effects to marine mammals. Thus, the summary impact rating for marine mammals would remain negligible to minor.

3.12.4.2.7 ALTERNATIVE 6A – MODIFIED NATURAL GAS PIPELINE ALIGNMENT: DALZELL GORGE ROUTE

Because the activities of Alternative 6A in the areas where marine mammals would occur would be the same as those of Alternative 2, the potential direct and indirect impacts on marine mammals under Alternative 6A would be the same as described above under Alternative 2. Impacts associated with climate change would also be the same as those discussed for Alternative 2. The effects determinations take into account applicable impact reducing design features and BMPs, as discussed in Alternative 2. No additional mitigation or monitoring measures have been identified to reduce effects to marine mammals. Thus, the summary impact rating for marine mammals would remain negligible to minor.

3.12.4.2.8 IMPACT COMPARISON – ALL ALTERNATIVES

A comparison of the impacts to marine mammals by alternative is presented in Table 3.12-12. As this table shows, the difference among alternatives that would affect the level of impacts to marine mammals is the change in the number of barge trips. Fewer barge trips means less chance of behavioral disturbance, injury or mortality, and contamination or fuel spills. While the changes in port location under several alternatives would change the location of impacts, the overall impact levels would remain the same. Thus, Alternatives 3A and 3B would have the least expected impact or risk of impact, with a summary impact level of negligible, and Alternatives 2, 4, 5A, and 6A, which all have the same level of barge traffic, would have the summary impact level of negligible to minor.

Table 3.12-12: Comparison of Impacts by Alternative*, Marine Mammals

Impact- causing Project Component	Alt. 2 – Proposed Action	Alt. 3A – LNG-Powered Haul Trucks	Alt. 3B – Diesel Pipeline	Alt. 4 – BTC Port	Alt. 5A – Dry Stack Tailings	Alt. 6A – Dalzell Gorge Route
Behavioral Disturbance Injury/Mortality	<p>122 river trips/year</p> <p>26 ocean trips/year from Dutch Harbor to Bethel.</p> <p>Increased barge traffic would increase: behavioral disturbance and risk of injury/ mortality.</p> <p><u>Overall effects would be negligible to minor.</u></p>	<p>83 river trips/year</p> <p>17 ocean trips/year from Dutch Harbor to Bethel</p> <p>Lower level of barge traffic would cause less increase in: behavioral disturbance and risk of injury/ mortality.</p> <p><u>Overall effects would be negligible</u></p>	<p>64 river trips/year</p> <p>12 ocean trips/year from Marine Terminals in Pacific Northwest or from Tesoro Refinery in Nikiski to Tyonek</p> <p>Lowest level of barge traffic would cause less increase in: behavioral disturbance and risk of injury/mortality. Additional vessel traffic into Tyonek would increase the potential for behavioral disturbance or injury/mortality.</p> <p><u>Overall effects would be negligible</u></p>	<p>122 river trips/year</p> <p>26 ocean trips/year from Dutch Harbor to Bethel.</p> <p>Increased barge traffic would increase: behavioral disturbance and risk of injury/ mortality.</p> <p>Location of port site further downstream would prevent impacts upriver of Birch Tree Crossing.</p> <p><u>Overall effects would be negligible to minor.</u></p>	Same as Alt. 2	Same as Alt. 2

Notes:

* The No Action Alternative would have no impacts on marine mammals.

3.12.5 BIRDS

As stated in Section 3.12.1 Regulatory Framework, the Migratory Bird Treaty Act (MBTA) of 1918 makes it unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product, manufactured or not. Many species of migratory birds protected under this act are found in the EIS Analysis Area.

Also, the Bald and Golden Eagle Protection Act (16 USC 668-668c), enacted in 1940, and amended several times since then, prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The Act provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb."

In addition to the protections offered by these two federal acts, migratory birds in the EIS Analysis Area are also protected by treaties the United States has with four other countries: Canada, Japan, Mexico, and the Soviet Union.

Migratory Bird Treaty with Canada (Convention Between the United States and Great Britain (for Canada) for the Protection of Migratory Birds; 39 Stat. 1702; TS 628), as amended -- This 1916 treaty adopted a uniform system of protection for certain species of birds which migrate between the United States and Canada, in order to assure the preservation of species either harmless or beneficial to man.

Migratory Bird Treaty with Japan (Convention Between the Government of the United States of America and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction, and Their Environment; 25 UST 3329; TIAS 7990) as amended -- This 1972 Convention is designed to provide for the protection of species of birds which are common to both countries, or which migrate between them by (1) enhancement of habitat, (2) exchange of research data, and (3) regulation of hunting.

Migratory Bird and Game Mammal Treaty with Mexico (Convention between the United States of America and the United Mexican States for the Protection of Migratory Birds and Game Mammals; 50 Stat. 1311; TS 912), as amended -- This 1936 treaty adopted a system for the protection of certain migratory birds in the United States and Mexico, which allows, under regulation, the rational use of certain migratory birds. It provides for enactment of laws and regulations to protect birds by establishment of closed seasons and refuge zones, prohibits killing of insectivorous birds, except under permit when harmful to agriculture, and provides for enactment of regulations on transportation of game mammals across the United States-Mexican border. The treaty was amended in 1995 to establish a legal framework for the subsistence take of birds in Alaska and northern Canada by Alaska Natives and Aboriginal people in Canada.

Migratory Bird Treaty with the Soviet Union (Convention Between the United States of America and the Union of Soviet Socialist Republics Concerning the Conservation of Migratory Birds and Their Environment, TIAS 9073) -- This Convention was signed in Moscow on November 19, 1976, and approved by the Senate on July 12, 1978. The Convention provides for

the protection of species of birds that migrate between the United States and the Soviet Union or that occur in either country and "have common flyways, breeding, wintering, feeding or molting areas."

Harvest of birds in the EIS Analysis Area is regulated by the ADF&G and the FWS. The Secretary of the Interior, under the authorization of the Migratory Bird Treaty Act, is authorized to determine when hunting of migratory game birds can take place in the United States and to adopt regulations for this purpose. This responsibility has been delegated to the FWS. Harvest of non-migratory gamebirds (grouse and ptarmigan) is regulated by the ADF&G. Subsistence hunting for migratory waterfowl is co-managed by the state and federal government through the Alaska Migratory Bird Co-Management Council, which consists of the FWS, the ADF&G, and representatives of Alaska's Native population.

3.12.5.1 AFFECTED ENVIRONMENT

This section addresses all bird species, including those listed as Species of Concern. There are two bird species listed as threatened that may be affected by the project: Steller's eider (*Polysticta stelleri*) and spectacled eider (*Somateria fischeri*). These two species are addressed in Section 3.14. Another listed bird species, the short-tailed albatross (*Phoebastria albatrus*), may occur along the marine portion of the proposed transportation corridor, but is not expected to be affected by the project-related barge traffic.

The affected environment for birds includes the entire proposed Project Area plus all bird populations and habitat in the vicinity (within 5 to 10 miles) of all components of the proposed project due to their mobility. The area of potential effect also includes migration corridors in the vicinity and downgradient areas of habitat.

The proposed Project Area lies in a region known to be exceptionally important bird habitat. The Yukon-Kuskokwim Delta has long been known for its abundance of waterbirds and was first established as a preserve and breeding ground for native birds in 1909 by President Theodore Roosevelt. The broad treeless delta, much of it less than 100 feet above sea level, provides breeding habitat for millions of geese, ducks, swans, shorebirds, cranes, loons, and grebes. Millions more arrive during fall migration to feed on the Refuge. A substantial portion of the global population of many species of waterfowl and shorebirds either breed or migrate through the Yukon-Kuskokwim Delta. Inland, the rivers run through higher and drier uplands and mountain peaks over 3,000 feet, providing an abundance of prime shrub and forest habitats that support thousands of migrant landbirds.

The proposed Project Area is divided into three components: the proposed mine site (pit, tailings storage, waste rock, camp, power plant); proposed transportation corridor (barge landing sites, route [Kuskokwim Bay, Kuskokwim River], fuel site in Dutch Harbor, Bethel fuel storage/port site, Jungjuk or Birch Tree Crossing port site, road from mine to port, airstrip, material sources); and the proposed pipeline (route, terminal facilities, construction access, material sources). The following descriptions of bird habitat-use are presented by project component.

The following description of avian use of the EIS Analysis Area is based on literature review, information obtained during scoping, and the results of the following project-specific surveys conducted between 2004 and 2013.

- Avian Surveys 2004-2005: Initial baseline study to determine what avian species are in the area surrounding the proposed project (ARCADIS 2013a)
- Avian Surveys 2007-2012: Habitat-based point-count surveys and raptor nest surveys (ARCADIS 2012d)
- Spring Wildlife Study 2004, 2007 and 2008 Nocturnal owl survey (ARCADIS 2008b)
- Pipeline Route Raptor Survey 2010-2011: Habitat-based raptor nest survey (ARCADIS 2012e)
- Waterway Transportation Corridor Wildlife Survey 2006-2009 (RWJ Consulting 2010b)
- Stream-nesting Waterbird Surveys 2013 (Owl Ridge 2013b)

The avian surveys conducted in the proposed mine site area were habitat-based and designed to calculate relative abundance, species richness and diversity. Within a 5-mile (8-kilometer) buffer around potential infrastructure, facilities and reference area were designated. Similar habitat types were surveyed within the facilities and reference areas in order to collect baseline data for monitoring the effects of the construction and operations phases of the proposed mine.

Surveys conducted along the pipeline route were designed to locate raptors, but swan nests were also recorded. Wildlife surveys conducted along the WTC were designed to census all animals observed, including avian species.

The stream-nesting waterbird surveys were conducted along Crooked Creek, Getmuna Creek, Jungjuk Creek, and the Kuskokwim River to characterize breeding waterbird use in the vicinity of the mine site and transportation corridor on the Kuskokwim River between Crooked Creek and Bethel.

The project-specific surveys are summarized in Table 3.12-13 below. This table includes the location, purpose, level of effort, summary of results, and reference document for each of the avian surveys conducted in the EIS Analysis Area between 2005 and 2013.

Table 3.12-13: Description of Avian Surveys Conducted in the Project Area 2005-2013

Survey Name and Dates	Location and Timing	Purpose	Level of Effort	Summary of results	Reference
Initial Mine Site Avian Surveys 2005	Initial breeding bird surveys and habitat mapping at the mine site	A reconnaissance survey was conducted to document species in the area, understand habitat types and avian use.	Not Available	The avian surveys in 2005 established suitable avian monitoring stations (point-count) within and adjacent to the proposed Project Area, and an initial index of bird use of habitat communities.	ARCADIS 2012d. 2012 Avian Point-Count and Raptor Survey Donlin Gold Project. November 2012.
Comprehensive Mine Site Avian Surveys 2007-2012	Six years of annual (June) breeding bird surveys at the mine site and associated roads.	Comprehensive, habitat-based point-count surveys and raptor nest surveys designed to calculate relative abundance, species richness and diversity. Similar habitat types were surveyed within the facilities and reference areas in order to collect baseline data for monitoring the effects of the construction and operations phases of the proposed mine.	150 meter radius fixed point-count surveys were conducted by two observers at each station for a 5 minute observation period. Surveys were conducted between 7AM and 7PM. The number of stations varied by year (from 234 in 2008 to 271 in both 2011 and 2012), but most stations were visited each year.	<u>2007</u> : 865 birds of 37 species <u>2008</u> : 1,397 birds of 46 species <u>2009</u> : 1,671 birds of 39 species <u>2010</u> : 1,870 birds of 40 species <u>2011</u> : 1,796 birds of 45 species <u>2012</u> : 1,285 birds of 32 species	ARCADIS 2012d. 2012 Avian Point-Count and Raptor Survey Donlin Gold Project. November 2012.
Mine Site Aerial Raptor Surveys 2007 to 2012	Mine site, alternative port sites and associated roads, between June 9th and June 18th.	To identify raptor species and nest activity.	Six years of annual surveys were conducted using a helicopter with two biologists. Polygonal project features (e.g., the alternative port sites and the mine area) were surveyed using parallel transects spaced no more than 0.5 miles (805 meters) apart. Linear features (e.g., port access road alternatives) were surveyed by focusing on favorable raptor nesting habitats (e.g., forested riparian areas and cliff faces).	The number of occupied nests located ranged from 15 to 63. Nests of 14 raptor species were identified in the proposed mine site area. The top five most abundant were Harlan's red-tailed hawk (30), peregrine falcon (28), red-tailed hawk (25), osprey (19), and common raven (18).	ARCADIS 2012e. 2012 Aerial Raptor Survey Donlin Gold Natural Gas Pipeline Study. August 2012.

Table 3.12-13: Description of Avian Surveys Conducted in the Project Area 2005-2013

Survey Name and Dates	Location and Timing	Purpose	Level of Effort	Summary of results	Reference
Spring Wildlife Study 2004, 2007, 2008, and 2009 including nocturnal owl survey	Nocturnal owl survey was conducted at the mine site during Feb 2004, June 2007, and March 2008 and 2009	To identify owl species and nest activity	Methods and timing varied by year but all involved visiting survey sites in likely habitat and either silent listening or using broadcasting owl calls and listening for a response.	None of the nocturnal owl surveys detected or observed owls. However, during the raptor nest surveys conducted in June of each year, Great Horned and Great Gray Owls have been identified.	ARCADIS. 2008b. DRAFT 2008 Spring Wildlife Study Donlin Creek Project.
Pipeline Route Raptor Survey 2010-2011-2012	The 2010 and 2011 surveys were conducted along the entire proposed pipeline route. The 2010 survey was conducted from June 1 to June 7. The 2012 survey was conducted only along the Jones Realignment.	Habitat-based raptor nest survey designed to locate nesting raptors; swan nests were also recorded.	The survey area encompassed an area of one mile on each side of the pipeline route. Raptors do not nest randomly in the environment, thus the survey included scanning the vegetation within the study area boundary from a distance in the aircraft, then concentrating survey efforts on suitable nesting habitats.	<u>2010</u> - 45 raptor nests were located; 24 were occupied and 21 were unoccupied. <u>2011</u> -66 nests were located, 24 of which were occupied and 42 were unoccupied. <u>2012</u> - 3 unoccupied nests were observed (two golden eagle and one common raven nest), and one occupied nest was observed (a common raven nest).	ARCADIS 2012e. 2012 Aerial Raptor Survey Donlin Gold Natural Gas Pipeline Study. August 2012.

Table 3.12-13: Description of Avian Surveys Conducted in the Project Area 2005-2013

Survey Name and Dates	Location and Timing	Purpose	Level of Effort	Summary of results	Reference
Waterway Transportation Corridor Wildlife Survey 2006-2009	The four years of wildlife and avian surveys were conducted along the Kuskokwim River between late May and late September. One team at Fowler Island and one team at Tuntutuliak.	<p>The original purpose was to obtain site-specific data for the potential proposed floating dock locations 1) in the Fowler Island area, and 2) near Helmick Point and immediately east of the village of Tuntutuliak.</p> <p>Subsequent years of observations were made to continue wildlife observations (i.e., point counts) from two fixed viewing locations in the Fowler Island area and from three fixed locations in the Helmick Point area using the same methods used in 2006 through 2008.</p>	Observations were made for 60 minutes at each of five stations five days a week.	During the 4 years of surveys, 100 species of birds were recorded, including 17 species of waterfowl and 12 species of shorebirds. The surveys documented pulses of birds that moved through the Kuskokwim River delta on an annual basis as a result of nesting, staging and migratory behavior. The total number of birds observed ranged from 27,398 in 2006, to 104,550 seen in 2008.	RWJ Consulting Inc. 2010b. 2009 Wildlife Observations on the Kuskokwim River-- Final Report. Document #DON002-503. Prepared for Donlin Creek LLC, Anchorage, Alaska. 428 pp.

Table 3.12-13: Description of Avian Surveys Conducted in the Project Area 2005-2013

Survey Name and Dates	Location and Timing	Purpose	Level of Effort	Summary of results	Reference
Stream-nesting Waterbird Surveys 2013	June, Crooked Creek, Getmuna Creek, Jungjuk Creek, and the Kuskokwim River between Crooked Creek and Bethel.	To characterize breeding waterbird use in the stream drainages associated with the proposed mine and access road (Donlin-Jungjuk Road), and along the proposed supply barging route on the Kuskokwim River	<p><i>Crooked Creek</i> – rafted for two days, approximately 30 river miles from Anaconda Creek to the mouth. By helicopter - from the Flat Creek-Donlin Creek junction to the mouth at the Kuskokwim River.</p> <p><i>Getmuna Creek</i> - 8 air miles.</p> <p><i>Jungjuk Creek</i> - By foot nearly 6 miles from the upper-most Donlin-Jungjuk Road stream crossing down to the Kuskokwim River.</p> <p><i>Kuskokwim River between Crooked Creek and Bethel</i> – two observers by motorboat, 205 miles in two days. Total observation time 13 hours.</p>	<p><i>Crooked Creek</i> - The combined surveys suggest that only one or two pairs each of red-breasted and common mergansers occur along Crooked Creek, and very few pairs of mallards and green-winged teal may be nesting within beaver sloughs.</p> <p><i>Getmuna Creek</i> - One each of mallard, green-winged teal, and Canada goose were recorded.</p> <p><i>Jungjuk Creek</i> - A pair of green-winged teal was observed at a blown-out beaver pond, and two male green-winged teal were flushed from one of the few beaver side-channel sloughs.</p> <p><i>Kuskokwim River between Crooked Creek and Bethel</i> - 1,099 individuals representing 11 species of waterfowl (ducks and geese), seven species of waterbirds (loons, gulls, and terns), three species of shorebirds, and five species of raptors (eagles, osprey, falcons, ravens) were recorded.</p>	Owl Ridge. 2013b. Donlin Gold Waterfowl Surveys 2013 – Crooked Creek, Getmuna Creek, Jungjuk Creek, and Kuskokwim River.

Sources: ARCADIS 2012d; RWJ Consulting 2010b; Owl Ridge 2013b.

3.12.5.1.1 MINE SITE

The proposed mine site area includes the mining pit, camp, and areas for tailings storage and waste rock facility. Spruce-dominated coniferous forests cover large portions of the mine site. On north-facing slopes and other areas where drainage is restricted by the presence of permafrost, stunted black spruce forests predominate. Black spruce forests also extend into bottomlands and other wet areas. In better drained sites such as those on floodplain terraces, near timberline, and on warmer south-facing slopes, white spruce forests are more prevalent. Mixed coniferous/deciduous forests are also common on drier slopes and consist of white spruce and paper birch. Mixed wood forest communities are also found on floodplain terraces and may include balsam poplar (*Populus balsamifera*).

River meander terraces, such as those along Crooked Creek, support a continuous succession of colonizing willow and alder followed by balsam poplar, which are replaced by spruce. Recently disturbed sites, timberline areas, north-facing slopes, and wetter areas support scrub communities dominated by willow, alder, and shrub birch (*Betula nana* and *B. glandulosa*). Bottomland bogs and other extremely wet areas are occupied by scrub-grained communities, including willow, dwarf birch (*Betula nana*), bog blueberry (*Vaccinium uliginosum*), Labrador-tea (*Ledum decumbens* subsp. *decumbens*), shrubby cinquefoil (*Dasiphora fruticosa*), cottongrasses (*Eriophorum* spp.), and sedge.

At higher elevations above timberline, dwarf alpine shrub communities are common and are dominated by ericaceous shrubs, dryas (*Dryas* spp.), and dwarf birch. These communities often have considerable lichen cover and some patches of bare ground. Extensive details of vegetation communities are found in Section 3.10, Vegetation and Section 3.11, Wetlands.

The results of the 2007-2012 breeding bird surveys in the mine site and access road corridor areas (ARCADIS 2012d) are in Table 3.12-14 and Table 3.12-15 below. The species observed are presented by habitat in descending order of abundance.

Table 3.12-14: Bird Species Observed During the Mine Site and Access Road Surveys (2007 - 2012)
by Needleleaf Forest, Shrub, and Broadleaf Forest Habitat in Order of Abundance

Needleleaf Forest Habitat (417 point counts)		Shrub Habitat (261 point counts)		Broadleaf Forest Habitat (95 point counts)	
Species	Number of birds	Species	Number of birds	Species	Number of Birds
Fox Sparrow	355	Fox Sparrow	395	Fox Sparrow	93
Common Redpoll	303	Common Redpoll	373	Common Redpoll	85
Swainson's Thrush	230	White-crowned Sparrow	204	Yellow-rumped Warbler	71
Ruby-crowned Kinglet	188	Gray-cheeked Thrush	146	Swainson's Thrush	70
White-crowned Sparrow	16	Varied Thrush	131	Ruby-crowned Kinglet	36
American Robin	162	American Robin	100	Golden-crowned Kinglet	29
Dark-eyed Junco	145	Dark-eyed Junco	74	White-crowned Sparrow	28
Gray-cheeked Thrush	126	Swainson's Thrush	60	American Robin	27
Yellow-rumped Warbler	106	Wilson's Warbler	35	Dark-eyed Junco	21
Gray Jay	98	Arctic Warbler	32	Varied Thrush	20
White-winged Crossbill	72	Ruby-crowned Kinglet	31	Unidentified	17
Alder Flycatcher	35	Yellow Warbler	31	Northern Waterthrush	14
Unidentified	35	American Pipit	30	Gray Jay	13
Olive-sided Flycatcher	32	Orange-crowned Warbler	29	Alder Flycatcher	10
Varied Thrush	28	Gray Jay	25	Blackpoll Warbler	9
Northern Waterthrush	20	Unidentified Bird	24	Orange-crowned Warbler	9
Blackpoll Warbler	16	Savannah Sparrow	12	Wilson's Warbler	9
Wilson's Snipe	14	Olive-sided Flycatcher	11	Olive-sided Flycatcher	8
Wilson's Warbler	14	Chipping Sparrow	9	Arctic Warbler	6
Orange-crowned Warbler	12	Alder Flycatcher	7	Wilson's snipe	6
Hermit Thrush	11	Common Raven	7	Boreal Chickadee	5
Bohemian Waxwing	10	Golden-crowned Sparrow	7	Cliff Swallow	4

Table 3.12-14: Bird Species Observed During the Mine Site and Access Road Surveys (2007 - 2012)
by Needleleaf Forest, Shrub, and Broadleaf Forest Habitat in Order of Abundance

Needleleaf Forest Habitat (417 point counts)		Shrub Habitat (261 point counts)		Broadleaf Forest Habitat (95 point counts)	
Species	Number of birds	Species	Number of birds	Species	Number of Birds
Black-capped Chickadee	6	Violet-green Swallow	7	Hermit Thrush	4
Pine Grosbeak	5	Hermit Thrush	6	American Pipit	2
Chipping Sparrow	4	Pine Grosbeak	6	Black-capped Chickadee	2
Townsend's Solitaire	4	Boreal Chickadee	5	Pine Grosbeak	2
Three-toed Woodpecker	4	Tree Swallow	5	Tree Swallow	2
Arctic Warbler	3	Horned Lark	3	Chipping Sparrow	1
Boreal Chickadee	3	Song Sparrow	3	Common Raven	1
Yellow Warbler	2	Blackpoll Warbler	2	Golden-crowned Kinglet	1
Tree Swallow	2	Bohemian Waxwing	2	Ovenbird	1
Common Raven	2	Golden Eagle	2	Red-breasted Nuthatch	1
Ovenbird	2	Northern Waterthrush	2	Rock Ptarmigan	1
American Tree Sparrow	1	Yellow Warbler	2	Song Sparrow	1
American Pipit	1	Golden-crowned Kinglet	1	Swainson's Hawk	1
Pine Siskin	1	Ovenbird	1		
Rough-legged Hawk	1	Rock Ptarmigan	1		
Golden-crowned Sparrow	1	Red-tailed Hawk	1		
		Three-toed Woodpecker	1		

Source: ARCADIS 2012d

Table 3.12-15: Bird Species Observed During the Mine Site and Access Road Surveys (2007-2012) by Wet and Dry Herbaceous, and Mixed Forest Habitat, in Order of Abundance

Wet Herbaceous Habitat (200 point counts)		Dry Herbaceous Habitat (163 point counts)		Mixed Forest Habitat (419 point counts)	
Species	Number of birds	Species	Number of birds	Species	Number of birds
Common Redpoll	126	Common Redpoll	196	Fox Sparrow	373
Fox Sparrow	76	Fox Sparrow	149	Swainson's Thrush	333
White-crowned Sparrow	72	White-crowned Sparrow	69	Ruby-crowned Kinglet	279
Whimbrel	58	American Robin	59	Common Redpoll	234
Tree Swallow	49	American Pipit	44	Yellow Warbler	188
Bank Swallow	45	Swainson's Thrush	33	Varied Thrush	174
American Robin	44	Varied Thrush	27	Dark-eyed Junco	124
Savannah Sparrow	44	Dark-eyed Junco	23	American Robin	103
Wilson's Warbler	26	Gray-cheeked Thrush	19	White-crowned Sparrow	101
Violet-green Swallow	21	Unidentified	18	Gray Jay	82
Lapland Longspur	20	Horned Lark	16	Unidentified	61
Unidentified	19	Ruby-crowned Kinglet	14	Wilson's Warbler	60
Wilson's Snipe	17	Arctic Warbler	7	Alder Flycatcher	47
Swainson's Thrush	16	Yellow-rumped Warbler	7	Olive-sided Flycatcher	45
Cliff Swallow	15	Gray Jay	6	Blackpoll Warbler	42
Dark-eyed Junco	13	Orange-crowned Warbler	6	Orange-crowned Warbler	31
Gray-cheeked Thrush	12	Olive-sided Flycatcher	6	White-winged Crossbill	22
Ruby-crowned Kinglet	12	Pine Grosbeak	5	Northern Waterthrush	17
Arctic Warbler	11	Savannah Sparrow	5	Hermit Thrush	15
Gray Jay	11	Wilson's Warbler	5	Song Sparrow	12
Yellow-rumped Warbler	8	Common Raven	4	Arctic Warbler	11

Table 3.12-15: Bird Species Observed During the Mine Site and Access Road Surveys (2007-2012) by Wet and Dry Herbaceous, and Mixed Forest Habitat, in Order of Abundance

Wet Herbaceous Habitat (200 point counts)		Dry Herbaceous Habitat (163 point counts)		Mixed Forest Habitat (419 point counts)	
Species	Number of birds	Species	Number of birds	Species	Number of birds
Olive-sided Flycatcher	7	White-winged Crossbill	2	Red-tailed Hawk	10
Alder Flycatcher	6	¹ Canada Goose and Cackling Goose	1	Wilson's Snipe	10
American Golden-Plover	6	Pine Siskin	1	Black-capped Chickadee	9
Blackpoll Warbler	6	Rock Ptarmigan	1	Ovenbird	9
Common Raven	4	Song Sparrow	1	Pine Grosbeak	7
Pacific Golden-Plover	4	Tree Swallow	1	Tree Swallow	7
Rusty Blackbird	4	Violet-green Swallow	1	Bank Swallow	6
Orange-crowned Warbler	3			Golden-crowned Kinglet	5
Parasitic Jaeger	3			Chipping Sparrow	4
Pine Grosbeak	3			Common Raven	4
Hermit Thrush	2			American Tree Sparrow	3
Horned Lark	2			Bohemian Waxwing	3
Northern Waterthrush	2			Savannah Sparrow	3
Rock Ptarmigan	2			Boreal Chickadee	2
White-winged Crossbill	2			American Pipit	1
Black –capped Chickadee	1			Glaucous-winged Gull	1
Golden-crowned Sparrow	1			Pacific Loon	1
Merlin	1			Short-billed Dowitcher	1
Northern Harrier	1			Spruce Grouse	1

Table 3.12-15: Bird Species Observed During the Mine Site and Access Road Surveys (2007-2012) by Wet and Dry Herbaceous, and Mixed Forest Habitat, in Order of Abundance

Wet Herbaceous Habitat (200 point counts)		Dry Herbaceous Habitat (163 point counts)		Mixed Forest Habitat (419 point counts)	
Species	Number of birds	Species	Number of birds	Species	Number of birds
Osprey	1			Townsend's Solitaire	1
Pacific Loon	1			Townsend's Warbler	1
				Three-toed Woodpecker	1
				Unidentified Woodpecker	1
				Violet-green Swallow	1
				Yellow Warbler	1

Notes:

1 Because these two species are difficult to distinguish they are considered together.

Source: ARCADIS 2012d.

Landbirds

Landbirds include the passerines (primarily), woodpeckers, pigeons and doves, and grouse and ptarmigan; this group excludes raptors.

The species observed during the breeding season, are likely using the mine site area as nesting habitat. Most of the species observed during the surveys are migrants, arriving in the area in the spring and flying back south in the fall.

Additional species that breed in the region may migrate over the mine site during spring and/or fall migration, but are not known to stop over there according to a 2013 investigation into waterfowl seasonal use patterns in the vicinity of the mine site (Owl Ridge 2013b). The report, which documented a search of the scientific literature and interviews with five people with local knowledge, concluded that while large flocks of fall migrating cackling and greater white-fronted geese pass over the proposed mine site, usually at high altitude and during the night, these birds do not stop over at the proposed mine site. During the fall small groups of tundra swans were also observed from the proposed mine site. During the spring migration cackling and greater white-fronted geese move slowly north stopping to rest and feed at many locations along the way, and may stop briefly in the vicinity of the mine site. No large groups of migrating ducks were reported in the area. Many of the duck species that nest in the region, including spectacled and common eider, scoters, greater scaup, and long-tailed ducks, generally follow rivers and other waterways to the coast and then migrate south along coastal marine routes (Owl Ridge 2013b).

Very few bird species remain in the Project Area year-round. Wintering species may include: common redpoll, hoary redpoll, white-winged crossbill (considered a Species of Concern), black-capped chickadee, boreal chickadee, snow bunting, ruffed grouse, ptarmigan species, common raven, gray jay, three-toed woodpecker, and pine grosbeak.

Cliff swallows (*Hirundo pyrrhonota*) have established nesting colonies on structures at the exploration camp, under the bridge over American Creek, and on machinery near Crooked Creek. Bank swallows, semipalmated plovers, and spotted sandpipers have colonized excavated areas near Crooked Creek. Savannah sparrows (*Passerculus sandwichensis*) are found in open areas adjacent to the current runway (Placer Dome Technical Services Limited 2005 as cited in ARCADIS 2013a).

Density Estimates

In order to assist with impact assessment, the avian survey data collected at the mine site and associated roads between 2007 and 2012 was used to calculate habitat-specific density estimates for the 18 most commonly observed species. These were the species that were observed more than 75 times during the 6 years of surveys. A simple estimate of bird density could be obtained by multiplying the number of birds observed by the area surveyed (150-meter radius circular plot = 17.5 acres). However, this estimate may not be valid because not all the birds present during the survey are detected. The birds detected are generally those species that are larger, sing more loudly, or are otherwise more easily detected. Therefore, in order to account for the variability in species detectability, it was necessary to use species-specific estimates of the effective area sampled.

The idea is that for each species there is a distance beyond which an observer wouldn't detect the bird. For example a loudly singing Swainson's thrush may be detected at a distance of 0.5

mile or more, while a ruby-crowned kinglet would have to be much closer to be detected. Not only does the detectability vary by species, it varies by habitat as well – birds are generally more difficult to detect in dense forest or shrubs than they are in more open habitat. Therefore the detectability of each species varies by habitat type. Published values of the effective detection radius for many of the species observed were found in “Using Binomial Distance-Sampling Models to Estimate the Effective Detection Radius of Point-Count Surveys Across Boreal Canada” (Matsuoka et al 2012). This document provides the “effective detection radius” (EDR) for many northern bird species for five different habitat types. These values were used to calculate the effective area surveyed for each species in each habitat (see Figure 3.12-3 for examples of how the effective area surveyed was calculated).

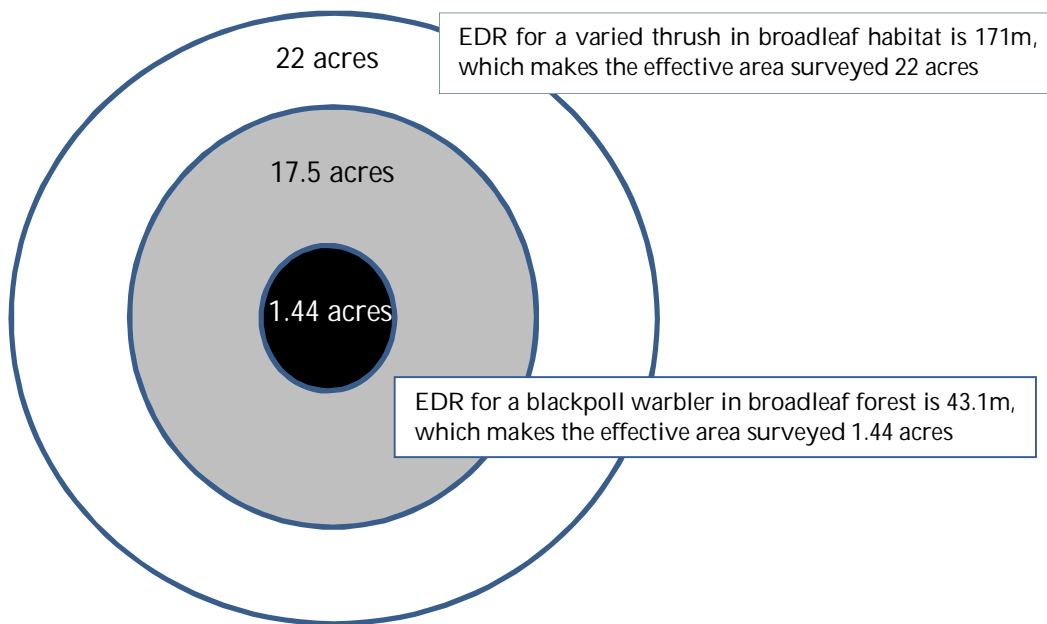


Figure 3.12-3: Illustration of Effective Area Surveyed Concept

Matsuoka et al 2012 does not include an EDR for the common redpoll or American pipit, so for those species an EDR value for a species with similar detectability was used. For the common redpoll the EDR for a pine siskin was used, and for the American pipit, the EDR for the American robin was used. When there was no habitat-specific EDR in Matsuoka et al 2012, the EDR for “habitats pooled” was used. Once the “effective area surveyed” was calculated for each species in the five habitats (broadleaf forest, mixed forest, herbaceous, shrub, and needleleaf forest) the area was multiplied by the number of point counts that were conducted in that habitat during the 6 years of surveys to calculate the total area surveyed. The total number of birds detected in that habitat was then divided by the total area surveyed to arrive at a density estimate. For example, the effective area surveyed for a fox sparrow in broadleaf forest habitat is 6.44 acres; that was multiplied by 95 point counts conducted in broadleaf forest habitat to equal a total of 612 acres surveyed. Ninety-two fox sparrows were observed in broadleaf forest habitat, divided by 612 acres surveyed equal an estimated density of 0.15 birds/acre. Table 3.12-16 presents the habitat-specific density estimates for the 18 most common species observed in each habitat type. Species of Concern are noted by shaded cells.

Table 3.12-16: Estimated Density of 18 Most Common Birds
Observed at the Mine Site and Access Roads by Habitat

Habitat	Species	Estimated Density (birds/acre)
Forested- Deciduous/Mixed	Fox sparrow	0.12
	Common redpoll	0.26
	Swainson's thrush	0.12
	White-crowned sparrow	0.04
	Ruby-crowned kinglet	0.24
	American robin	0.04
	Gray-cheeked thrush	0.03
	Yellow-rumped warbler	0.20
	Dark-eyed junco	0.06
	Varied thrush	0.01
	Gray jay	0.05
	Wilson's warbler	0.02
	Olive-sided flycatcher	0.01
	Alder flycatcher	0.02
	White-winged crossbill	0.01
	Orange-crowned warbler	0.01
	American pipit	0.003
	Blackpoll warbler	0.07
Herbaceous	Fox sparrow	0.03
	Common redpoll	0.26
	Swainson's thrush	0.02
	White-crowned sparrow	0.05
	Ruby-crowned kinglet	0.01
	American robin	0.03
	Gray-cheeked thrush	0.01
	Yellow-rumped warbler	0.01
	Dark-eyed junco	0.02
	Varied thrush	0.02
	Gray jay	0.01
	Wilson's warbler	0.01
	Olive-sided flycatcher	0.01
	Alder flycatcher	0.004
	White-winged crossbill	0.003
	Orange-crowned warbler	0.01
	American pipit	0.0014
	Blackpoll warbler	0.01
Needleleaf Forest	Fox sparrow	0.08
	Common redpoll	0.30
	Swainson's thrush	0.07
	White-crowned sparrow	0.06
	Ruby-crowned kinglet	0.08
	American robin	0.04
	Gray-cheeked thrush	0.05
	Yellow-rumped warbler	0.08
	Dark-eyed junco	0.06
	Varied thrush	0.003
	Gray jay	0.08
	Wilson's warbler	0.01
	Olive-sided flycatcher	0.005
	Alder flycatcher	0.02

Table 3.12-16: Estimated Density of 18 Most Common Birds
Observed at the Mine Site and Access Roads by Habitat

Habitat	Species	Estimated Density (birds/acre)
	White-winged crossbill	0.05
	Orange-crowned warbler	0.003
	American pipit	0.0002
	Blackpoll warbler	0.02
Shrub	Fox sparrow	0.01
	Common redpoll	0.42
	Swainson's thrush	0.03
	White-crowned sparrow	0.09
	Ruby-crowned kinglet	0.02
	American robin	0.05
	Gray-cheeked thrush	0.08
	Yellow-rumped warbler	0.04
	Dark-eyed junco	0.07
	Varied thrush	0.02
	Gray jay	0.03
	Wilson's warbler	0.03
	Olive-sided flycatcher	0.002
	Alder flycatcher	0.01
	White-winged crossbill	0.00
	Orange-crowned warbler	0.02
	American pipit	0.01
	Blackpoll warbler	0.003

Source: Calculated from data collected by ARCADIS 2007-2012e.

Raptors

During the 2007-2012 avian surveys at the mine site and access roads, the most raptor species were observed in wet herbaceous habitats where one northern harrier, one osprey, and one merlin were observed. In needleleaf forest habitat one rough-legged hawk was observed. In shrub habitat one red-tailed hawk was seen, and in broadleaf forest habitat one Swainson's hawk was observed.

Aerial raptor nest surveys were conducted between June 9th and June 18th in the vicinity of the mine site and access roads area from 2007 to 2012 to identify raptor species and nest activity (ARCADIS 2012e). The number of occupied nests located ranged from 15 to 63. Nests of 14 raptor species were identified during the six years of surveys. Table 3.12-17 and Table 3.12-18 list the results. These numbers represent the total number of nests observed over the 6-year survey period, not the number of nests in the area at any one time. The number may include multiple countings of the same nest.

Table 3.12-17: Number of Raptor Nests Located in the Vicinity of the Donlin Gold Proposed Mine Site Area and Access Roads Between 2007 and 2012

Year	Occupied	Unoccupied	Total Number of Nests
2007	17 (3 Bald Eagles, 4 Common Ravens, 1 Merlin, 1 Harlan's Hawk, 2 Osprey, 2 Peregrine Falcons, 2 Red-tailed Hawks, and 2 Rough-legged Hawks)	12	29
2008	46 (4 Bald Eagles, 1 Great Gray Owl, 3 Great Horned Owls, 2 Golden Eagles, 1 Merlin, 5 Osprey, 10 Peregrine Falcons, 12 Red-tailed Hawks, and 7 Rough-legged Hawks)	49	95
2009	46 (2 Bald Eagles, 3 Common Ravens, 5 Great Gray Owls, 1 Great Horned Owl, 2 Golden Eagles, 13 Harlan's Hawks, 4 Osprey, 8 Peregrine Falcons, 1 Red-tailed Hawk, 4 Rough-legged Hawks, and 3 unidentified buteos)	67	113
2010	87 (15 Bald Eagles, 5 Golden Eagles, 6 Common Ravens, 9 Great Gray Owls, 4 Great Horned Owls, 14 Harlan's Hawks, 8 Osprey, 8 Peregrine Falcons, 9 Red-tailed Hawks, 4 Rough-legged Hawks, 3 unidentified buteos, 1 Gyrfalcon, and 1 unidentified raptor)	74	161
2011	85 (14 Bald Eagles, 13 Common Ravens, 3 Great Gray Owls, 2 Great Horned Owls, 14 Harlan's Hawks, 3 Merlins, 1 Golden Eagle, 3 Northern Harriers, 6 Osprey, 12 Peregrine Falcons, 8 Red-tailed Hawks, 5 Rough-legged Hawks, and 1 unidentified raptor)	120	205
2012	92 (25 Bald Eagles, 11 Common Ravens, 1 Golden Eagle, 4 Great Gray Owls, 1 Merlin, 2 Golden Eagles, 3 Northern Harriers, 14 Harlan's Hawks, 8 Osprey, 10 Peregrine Falcons, 6 Red-tailed Hawks, 6 Rough-legged Hawks, and 1 unidentified buteo).	119	211

Source: ARCADIS 2012d.

Table 3.12-18: Number of Occupied Raptor Nests Found at the Mine Site or Access Roads Between 2007 and 2012 by Species

Common Name	Scientific Name	Total Number of Occupied Nests*	Range of Nests Found Annually Over 6 Years of Surveys
Bald Eagle	<i>Haliaeetus leucocephalus</i>	63	2-25
Red-tailed Hawk (Harlan's)	<i>Buteo jamaicensis harlani</i>	56	0-14
Peregrine Falcon	<i>Falco peregrines</i>	50	2-10
Red-tailed Hawk	<i>Buteo jamaicensis</i>	38	1-7
Osprey	<i>Pandion haliaetus</i>	33	2-5
Rough-legged Hawk	<i>Buteo lagopus</i>	28	2-6
Great Gray Owl	<i>Strix nebulosa</i>	22	1-9
Great Horned Owl	<i>Bubo virginianus</i>	10	0-5
Northern Harrier	<i>Circus cyaneus</i>	6	0-3
Merlin	<i>Falco columbarius</i>	6	0-3
Unknown Buteo	NA	5	0-2
Unknown	NA	2	0-1
Gyrfalcon	<i>Falco rusticolus</i>	2	0-1

Notes:

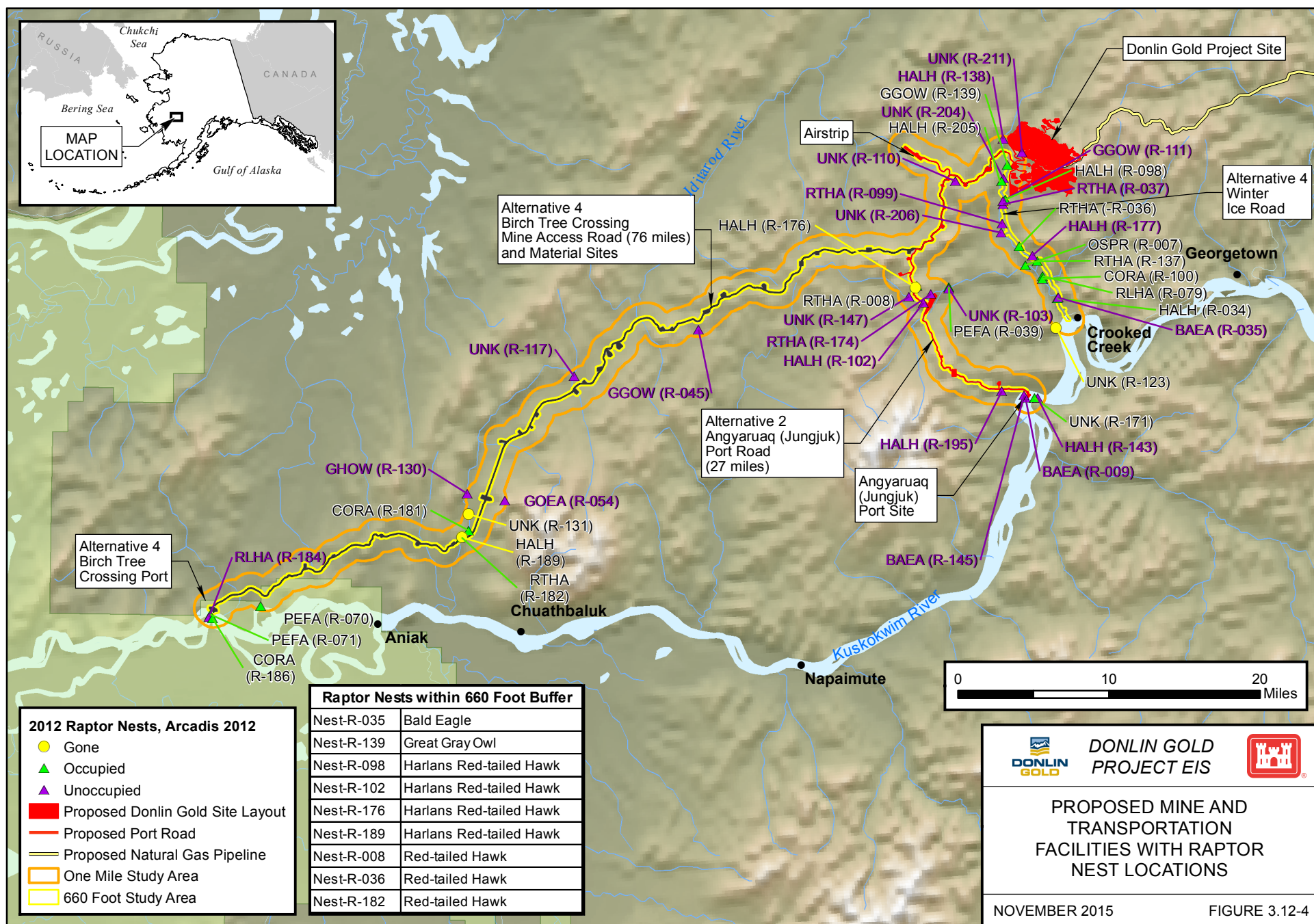
* This number represents the total number of nests observed over the 6-year survey period, not the number of nests in the area at any one time. The number may include multiple countings of the same nest.

Source: ARCADIS 2012d.

Figure 3.12-4 shows the locations of raptor nests identified during the most recent (2012) survey. Bald eagles were the most abundant species observed during all survey years, followed closely by Harlan's red-tailed hawks, peregrine falcons (a Species of Concern) and red-tailed hawks. Raptor nests were located in both living and dead spruce trees and cliffs or rocky outcrops. All occupied nests identified were located within 400 meters (0.25-mile) of a cliff, river, creek, or stream.

These data confirm that these raptor species are using the proposed mine site area for breeding. Both eagle species are protected by the Bald and Golden Eagle Protection Act, which requires a permit from the FWS to "take" either species, which could occur through any disturbance to nests. The other raptor species are protected under the Migratory Bird Treaty Act.

Most of these species are migrants, present only during spring, summer, and early fall. Very few raptor species remain in the proposed mine site area year-round. While no winter surveys have been conducted, raptors known to winter in the region include the gyrfalcon (Species of Concern), northern hawk owl, boreal owl, great horned owl, great gray owl, and snowy owl. Camp personnel have frequently observed northern hawk owls near the camp during the winter (ARCADIS 2013a).



No nests of the smaller cavity-nesting owl species were located. However, northern hawk owls (*Surnia ulula*) and boreal owls (*Aegolius funereus*) were observed during the point-count and aerial raptor nest surveys after being flushed from forest thickets (ARCADIS 2011b).

Waterbirds

Waterfowl and shorebirds were observed in low numbers in the proposed mine site area during point-count-based avian surveys (Table 3.12-19). Low numbers of waterbirds are thought to nest in the proposed mine site area; nests are expected in areas bordering the larger creeks and wetland habitat-type areas (i.e., Crooked Creek) (Placer Dome Technical Services Limited 2005).

Stream-nesting Waterbird Surveys

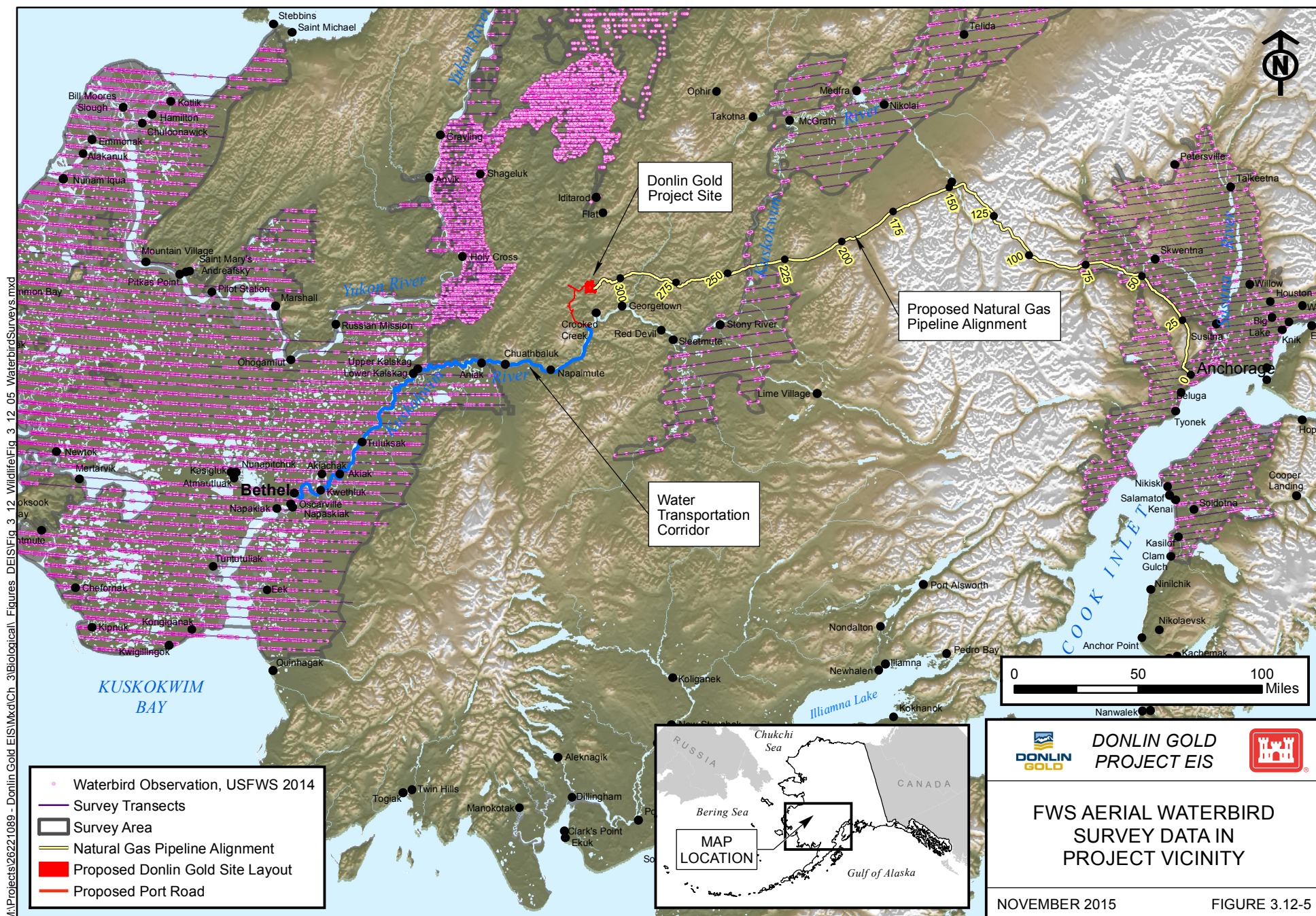
In June 2013, surveys were conducted to characterize breeding waterbird use in the stream drainages associated with the proposed mine and access road (Donlin-Jungjuk Road), and along the proposed supply barging route on the Kuskokwim River between Crooked Creek and Bethel. Table 3.12-21 in the following section, summarizes the methods and results from the stream portion of the surveys (ARCADIS 2013a).

Table 3.12-19: Waterfowl and Shorebird Species Observed During Avian Surveys in the Proposed Mine Site Area

Common Name	Scientific Name	Common Name	Scientific Name
American Golden-plover	<i>Pluvialis dominica</i>	Pacific Loon	<i>Gavia pacifica</i>
Greater-white Fronted Goose	<i>Anser albifrons</i>	Common Merganser	<i>Mergus merganser</i>
American Widgeon	<i>Anas penelope</i>	Parasitic Jaeger	<i>Stercorarius parasiticus</i>
Long-tailed Jaeger	<i>Stercorarius longicaudus</i>	Common Snipe	<i>Gallinago gallinago</i>
Blue-winged Teal	<i>Anas discors</i>	Red-breasted Merganser	<i>Mergus serrator</i>
Mallard	<i>Anas platyrhynchos</i>	Glaucous-winged Gull	<i>Larus glaucescens</i>
Bristle-thighed Curlew	<i>Numenius tahitiensis</i>	Short-billed Dowitcher	<i>Limnodromus griseus</i>
Northern Pintail	<i>Anas acuta</i>	Greater Scaup	<i>Aythya marila</i>
Northern Shoveler	<i>Anas clypeata</i>	Tundra Swan	<i>Cygnus columbianus</i>
Bufflehead	<i>Bucephala albeola</i>	Green-winged Teal	<i>Anas crecca</i>
Pacific Golden-plover	<i>Pluvialis fulva</i>	Whimbrel	<i>Numenius phaeopus</i>
Canada Goose	<i>Branta canadensis</i>		

Source: ARCADIS 2010b

The FWS has conducted aerial waterbird surveys of wetlands around Alaska for many years. These surveys provide abundance, distribution, and trend information for many species. Figure 3.12-5 shows the location and results of these surveys in the EIS Analysis Area.



A series of aerial surveys of breeding waterbirds were conducted on the Yukon Delta National Wildlife Refuge (Platte and Butler 1993) which is in the vicinity of the transportation corridor, the Tanana/Kuskokwim area (Platte 2003) which is in the vicinity of the mine site, and the Kenai/Susitna area (Platte et al. 2012), in the vicinity of the eastern end of the pipeline.

The Tanana/Kuskokwim survey area is located closest to the mine site. The average density estimate for ducks was 6.5/km² (Platte 2003). Mallards, northern pintails, American wigeons, and greater and lesser scaup were the most widely distributed species, occurring over most of the survey area. The lower Kuskokwim River area near Sleetmute (the part of the survey area closest to the mine site) was relatively sparsely populated with waterbirds. Species found in higher number near Sleetmute include mew gulls, mallards, goldeneyes, Canada and cackling geese, trumpeter swans, and greater white-fronted geese.

3.12.5.1.2 TRANSPORTATION FACILITIES

The proposed transportation facilities area includes:

- The 27-mile long road from the proposed mine to the Angyaruaq (Jungjuk) Port site and the 76-mile long road from the proposed mine to the BTC Port site (including material sources);
- The Angyaruaq (Jungjuk) and BTC port sites;
- The Kuskokwim River barge route from the port site to the fuel storage/port site in Bethel;
- The barge route from Bethel to Dutch Harbor; and
- The fuel storage site in Dutch Harbor.

Because of the differences in species presence and use, birds along the mine access roads are discussed separately. The port sites are included in the discussion of the Kuskokwim River route.

A series of aerial surveys of breeding waterbirds were conducted on the Yukon Delta National Wildlife Refuge (Platte and Butler 1993) in the vicinity of the Kuskokwim River transportation route, the Tanana/Kuskokwim area (Platte 2003) in the vicinity of the mine site, and the Kenai/Susitna area (Platte et al. 2012), in the vicinity of the eastern end of the pipeline. The survey conducted in the Refuge found waterbirds widespread throughout the survey area. Total duck densities averaged 15/km². The coastal zone between the Askinuk Mountains and Nelson Island, and the mouths of the Yukon and Kuskokwim rivers contained the highest densities over the largest areas for combined duck species (Platte and Butler 1993). The species and areas with higher densities adjacent to the Kuskokwim River include all ducks (locations near Bethel had greater than 5-10/km²), sea ducks (areas upstream of Bethel had greater than 4 birds/km²), and dabbling ducks (area northeast of Bethel had greater than 2.5-6.5 birds/km²). Northern pintails, greater and lesser scaup, tundra swans, and black scoters had the most widespread distribution and greatest numbers while the species nesting close to the Kuskokwim River included green-winged teal and American wigeon.

Mine Site – Angyaruaq (Jungjuk) Port Road

The Angyaruaq (Jungjuk) Port road would be 27 miles long and used primarily during the barging season. The habitat along the proposed road and port site is characterized by rolling hills that support a boreal forest ecosystem. Black spruce forest is the dominant vegetation community within the area; other vegetation community types include alpine tundra, wet herbaceous, wetland, shrub, broadleaf forest, and mixed forest. The most prevalent types are open black spruce forest and spruce woodland–shrub. These two types are common across most hillsides, except on very steep slopes and headwaters where mixed and deciduous forest types are dominant.

Landbirds

The proportion of habitat types along the proposed road and port site are similar to those found at the proposed Mine Site. As shown in Tables 3.10-1 and 3.10-2 in Section 3.10, Vegetation, both the mine site and the proposed road/port site are dominated by coniferous forest (63 percent at mine site and 61 percent at the road/port site) and have similar proportions of mixed forest, shrub, and herbaceous habitat. Because of the similarity in habitat, the composition of landbirds is expected to be similar to that described for the Mine Site.

Raptors

The 2012 aerial raptor nesting survey (ARCADIS 2012e) identified eight nests adjacent to the proposed road (Table 3.12-20).

Table 3.12-20: Raptor Nests Located Near the Proposed Jungjuk Road in 2012

Species	Occupied	Unoccupied	General Location
Red-tailed Hawk		1	Near Getmuna Creek
Harlan's Hawk	1	2	2 near Getmuna Creek, 1 near unidentified Creek
Bald Eagle	1	1	Both near Kuskokwim River
Unidentified		2	1 near Getmuna Creek, 1 near the intersection of the airport road.

Source: ARCADIS 2012a.

Waterbirds

The habitats along the proposed road are similar to those found at the proposed Mine Site, and the avian point-count surveys included several stations along the proposed road; therefore the waterbird use of this area is expected to be very similar to that described for the Mine Site. Low numbers of waterbirds were recorded during the point-count surveys. Higher numbers of waterbirds may occur where the road would cross Crooked Creek and Getmuna Creek, and in the vicinity of the Kuskokwim River.

Stream-nesting Waterbird Surveys

In June 2013 surveys were conducted to characterize breeding waterbird use in the stream drainages associated with the proposed mine and access road (Donlin-Jungjuk Road), and along the proposed supply barging route on the Kuskokwim River between Crooked Creek and Bethel. Error! Not a valid bookmark self-reference. summarizes the methods and results from the stream portion of the surveys (Owl Ridge 2013b).

Table 3.12-21: 2013 Mine Site and Transportation Facilities Stream-nesting Surveys

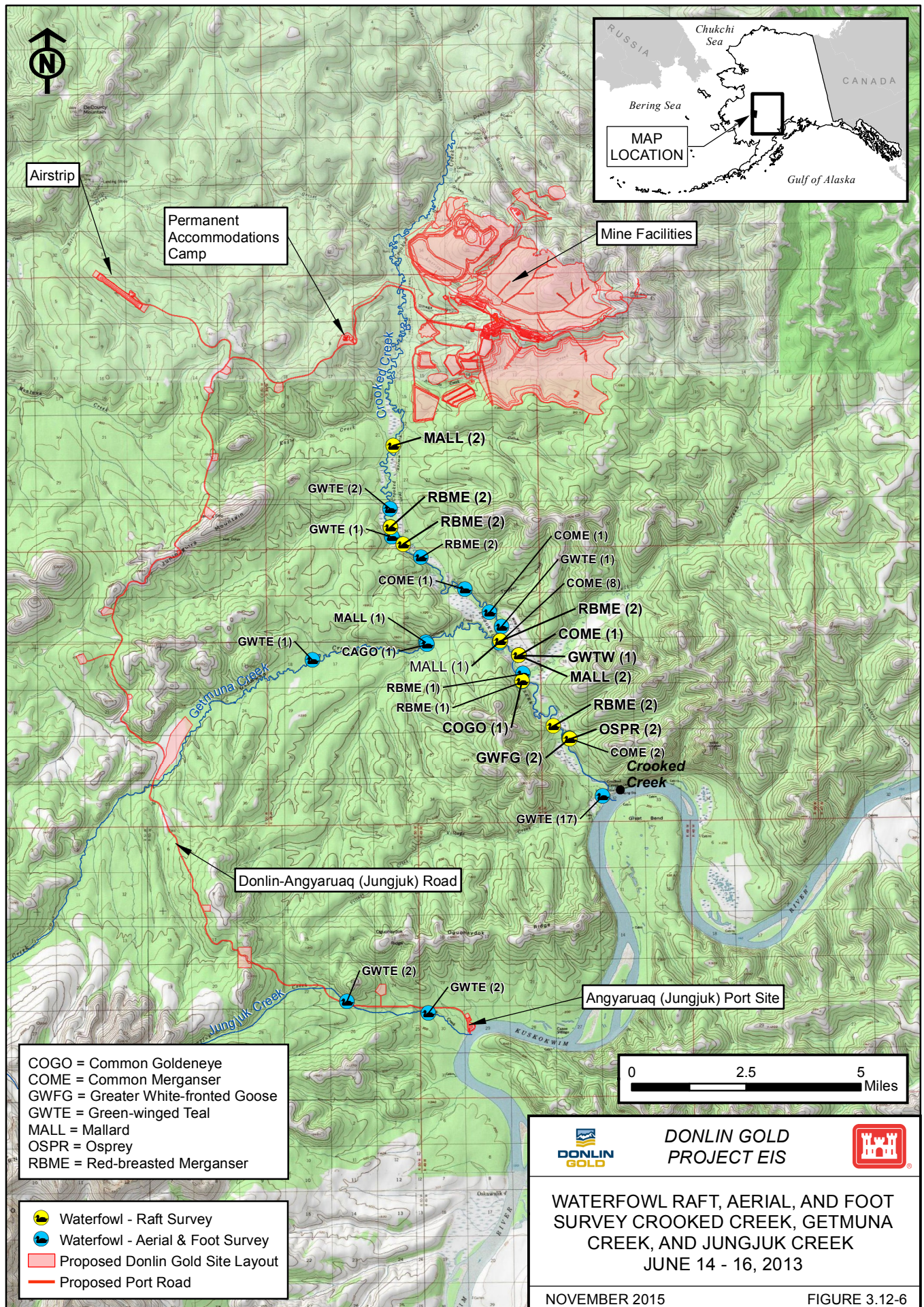
Location	Survey Methods	Results
Crooked Creek	Rafting - two days, approximately 30 river miles from Anaconda Creek to the mouth). Helicopter - from the Flat Creek-Donlin Creek junction to the mouth at the Kuskokwim River.	The combined surveys suggest that only one or two pairs each of red-breasted and common mergansers occur along Crooked Creek, and very few pairs of mallards and green-winged teal may be nesting within beaver sloughs.
Getmuna Creek	Helicopter - 8 air miles.	One each of mallard, green-winged teal, and Canada or cackling goose were recorded.
Jungjuk Creek	By foot - nearly 6 miles from the upper-most Donlin-Jungjuk Road stream crossing down to the Kuskokwim River.	A pair of green-winged teal were observed at a blown-out beaver pond, and two male green-winged teal were flushed from one of the few beaver side-channel sloughs. Jungjuk Creek is swift flowing, alder-choked, and provides little wetland breeding habitat for waterbirds.

Source: Owl Ridge 2013.

The surveys of Crooked, Getmuna, and Jungjuk creeks suggest only a very few pairs of red-breasted mergansers, common mergansers, green-winged teal, mallards, and Canada or cackling geese may nest in the stream drainages associated with the proposed mine and access road. Figure 3.12-6 shows the results of all three surveys. No harlequin ducks were observed during any of the surveys. Only Crooked Creek and the lowest reaches of Getmuna Creek are wide enough to be suitable habitat, and Crooked Creek is dominated by silt substrate rather than the gravel and cobbles this species prefers (Crowley 1994).

The survey also determined that the following drainages did not appear to be suitable breeding habitat for waterfowl: American Creek, Anaconda Creek, Crevice Creek, Quartz Gulch, Snow Gulch, Queen Gulch, Lewis Gulch, and Omega Gulch. These swift-flowing streams are less than 6 feet wide with densely vegetated and often steep riparian areas dominated by alder and black spruce. Quartz and Lewis creeks, and Omega Gulch were dry at the time of the survey.

The survey of 205 miles of the Kuskokwim River from Crooked Creek to Bethel yielded sightings of nearly 1,110 birds of 26 species of waterfowl, waterbirds, shorebirds, and river associated raptors (see Table 3.12-24 for complete list). Arctic terns (a Species of Concern) and gulls (glaucous, glaucous-winged, and mew) were the most common birds recorded, especially along the lower half of the river (closer to the coast). American wigeon, northern pintails, mallards, and greater white-fronted geese were the most common waterfowl, while spotted and other sandpipers were the most common shorebirds. Twenty bald eagles, ten osprey, and four peregrine falcons were also recorded. Most waterfowl, waterbirds, and shorebirds were found on gravel bars or at the heads of sand islands. Most eagles and osprey were located near the mouths of clear-water streams.



Mine Site – Birch Tree Crossing Port and Road

The Birch Tree Crossing Port site would be located on private ANCSA lands within the Yukon-Kuskokwim Delta National Wildlife Refuge.

Landbirds

The BTC Port Road would be 76 miles long and would cross through a higher proportion of shrub vegetation compared to the mine site and the Angyaruaq (Jungjuk) Port site and road. The breeding bird surveys conducted at the mine site and associated roads included 37 survey points located within 0.5 mile of the proposed BTC Port Road. A list of the 40 bird species observed at these survey points is provided in Table 3.12-22. Species of Concern are shaded gray.

Table 3.12-22: Bird Species Observed at Points within 0.5 mile of the BTC Port Road, in Order of Abundance.

Species	Number Observed
Common Redpoll	77
Fox Sparrow	76
White-crowned Sparrow	62
American Robin	39
Whimbrel	38
Wilson's Warbler	31
Swainson's Thrush	25
Savannah Sparrow	24
Dark-eyed Junco	24
Gray-cheeked Thrush	19
Olive-sided Flycatcher	14
Yellow-rumped Warbler	12
Arctic Warbler	11
Blackpoll Warbler	11
Lapland Longspur	9
Gray Jay	8
Varied Thrush	7
Alder Flycatcher	6
American Golden Plover	6
Cliff Swallow	6
Common Raven	5
Orange-crowned Warbler	4
American Pipit	2
Chipping Sparrow	2

Table 3.12-22: Bird Species Observed at Points within 0.5 mile of the BTC Port Road, in Order of Abundance.

Species	Number Observed
Black-capped Chickadee	1
Glaucous-winged Gull	1
Golden Eagle	1
Hermit Thrush	1
Horned Lark	1
Merlin	1
Northern Waterthrush	1
Pomarine Jaeger	1
Pacific Golden Plover	1
Pacific Loon	1
Pine Grosbeak	1
Ruby-crowned Kinglet	1
Rock Ptarmigan	1
Red-tailed Hawk	1
Three-toed Woodpecker	1
White-winged Crossbill	1

Notes:

1 Species of concern are shaded gray:

Source: ARCADIS 2010b.

Raptors

The raptor nests observed in 2012 are listed in Table 3.12-23.

Table 3.12-23: Raptor Nests Located Near the Proposed Birch Tree Crossing in 2012

Species	Occupied	Unoccupied	General Location
Red-tailed Hawk	1		Adjacent to the proposed port road approximately 19 miles northeast of the port site.
Common Raven	2		1 adjacent to the proposed port road approximately 20 miles northeast of the port site, 1 near the port site.
Peregrine Falcon	2		Both near the port site
Golden Eagle		1	Adjacent to the proposed port road approximately 22 miles northeast of the port site
Great Horned Owl		1	Adjacent to the proposed port road approximately 22 miles northeast of the port site
Great Gray Owl		1	Adjacent to the proposed port road approximately 50 miles northeast of the port site
Rough-legged Hawk		1	Near the port site
Unknown raptor		1	Adjacent to the proposed port road approximately 40 miles north of the port site.

Source: ARCADIS 2012e.

Waterway Transportation Routes

The waterway transportation routes include the barge routes from the Angyaruaq (Jungjuk) or BTC Port site to Bethel and then on to Dutch Harbor and the U.S. West Coast. It is 177 river miles from the Angyaruaq (Jungjuk) Port site to Bethel, and from there to the mouth at Kuskokwim Bay is another 73 miles; from Kuskokwim Bay to Dutch Harbor is 460 miles, for a total of 710 miles. The Birch Tree Crossing port site is within the Yukon-Kuskokwim National Wildlife Refuge and is about 117 river miles from Bethel.

An alternate proposed barge route would run from the Tyonek port site to the U.S. West Coast. The non-marine portion of the route runs through the Yukon-Kuskokwim Delta, an area that has been documented by the ADF&G and the FWS as an important waterfowl and shorebird habitat. The ADF&G has identified the mouth and lower region of the Kuskokwim River as a "Most Environmentally Sensitive Area" due to the dense populations of waterfowl during the spring and fall seasons and the presence of anadromous lakes and streams. This area includes the Yukon Delta National Wildlife Refuge (Cenaliulriit CRSA CMP 2006). The Kuskokwim River enters the Refuge near Aniak, approximately 50 miles downstream from the Angyaruaq (Jungjuk) port site. From Aniak downstream to Kuskokwim Bay the river flows through the Yukon Delta National Wildlife Refuge.

The FWS (2014c) describes the bird use of the Refuge as follows:

The refuge supports one of the largest aggregations of water birds in the world. Over one million ducks and a half million geese breed there annually and in some summers, up to a

third of the continent's northern pintails can be found on the refuge. In addition, nearly 40,000 loons, 40,000 grebes, 100,000 swans and 30,000 cranes return to the refuge each spring to nest. Millions of shorebirds use the refuge for both breeding and staging. In terms of both density and species diversity, the delta is the most important shorebird nesting area in the country, and the vast intertidal zone is the most important wetland for post-breeding shorebirds on the west coast of North America. Undoubtedly, these species have been a strong factor in shaping the coastal ecosystem.

The refuge hosts approximately 80% of the continental breeding population of black brant and nearly all emperor geese. Cackling, Canada, and Pacific greater white-fronted geese number over 175,000 and 420,000, respectively. Principal species of ducks that occur on the refuge include northern pintail, greater scaup, and wigeon. Harlequin ducks breed in many of the watersheds draining the Kuskokwim Mountains, as well as other suitable habitats. Common eiders are locally "common" in the vicinity of some brant colonies. The formerly abundant spectacled eiders have declined precipitously over the last 25 years.

Nineteen species of raptors have been recorded on the refuge, including golden eagles, bald eagles, and peregrine falcons. The Kisaralik River is among the most important areas on the refuge for nesting raptors, and supports one of the densest breeding populations of breeding golden eagles in North America.

In 1998 the Refuge initiated a landbird monitoring program of the lower Kuskokwim River, which included Breeding Bird Surveys between Aniak and Napaskiak. Harwood (2000 and 2002) counted 86 species in 2000 and 89 species in 2002. During both surveys the most abundant and widespread species observed was the northern waterthrush. The following six species were the common both years, with over 1 bird observed per 3-minute survey: northern waterthrush, fox sparrow, bank swallow, gray-cheeked thrush, yellow warbler, and blackpoll warbler.

Harwood analyzed abundance indices for eight Species of Concern: gyrfalcon, gray-cheeked thrush, varied thrush, blackpoll warbler, golden-crowned sparrow, McKay's bunting, rusty blackbird, and hoary redpoll, and concluded from the detection frequencies that the survey could help to monitor four of the species (gray-cheeked thrush, varied thrush, blackpoll warbler, and rusty blackbird).

Many of these species breed at high densities compared to other parts of their breeding ranges (Cotter and Andres 2000).

Downriver of Napaskiak there are 23 species of birds of conservation concern, including 13 of the 20 shorebirds of conservation concern in Alaska. Most of these have large portions of their global populations breeding or migrating through the Yukon-Kuskokwim Delta.

Harlequin ducks breed in many of the watersheds draining the Kuskokwim Mountains, as well as other suitable habitats. McCaffery and Harwood (1994) documented 164 pairs of harlequin ducks during surveys on the Kisaralik, Kwethluk, and Eek rivers and their tributaries. Weir (et al. 1982) also found harlequin ducks nesting throughout the Kilbuk and Ahklun mountains and molting along the coast.

The Yukon-Kuskokwim Delta supports extremely large numbers of breeding shorebirds, with densities in wetlands of 416 shorebirds/km² recorded by McCaffery (et al 2012). These densities are the highest recorded in North America (Bart and Johnston 2012). McCaffery (et al 2012) estimates that the entire Delta probably supports several million nesting shorebirds.

The Yukon Delta NWR is a Western Hemisphere Shorebird Reserve network site of hemispheric importance. Such a site provides staging, nesting, or breeding grounds for at least 500,000 shorebirds annually or at least 30 percent of the biogeographic population of any species. The Yukon Delta NWR is also an East Asian Australasian Flyway Partnership Network Site for migratory waterbirds. Such a site supports at least 20,000 migratory waterbirds annually or appreciable numbers of an endangered or vulnerable population.

Kuskokwim River Wildlife Surveys

In order to supplement the regional resource knowledge with additional site-specific data, wildlife (including bird) observations were made on the Kuskokwim River. Survey stations were located near Fowler Island and the village of Tuntutuliak, both of which are located downstream of Bethel near the southern end of the Kuskokwim River route (Figure 3.12-7). Avian observation data were collected between late May and October in 2006, 2007, 2008, and 2009, (RWJ Consulting Inc. 2008c, 2009, 2010b).

A greater number of shorebird species were observed at the Tuntutuliak viewing stations compared to the Fowler Island area viewing stations. This may be due to its location further downriver, or the importance of the Tuntutuliak tidal flats as habitat for shorebird populations. At Fowler Island stations, more gulls and terns were observed. At Tuntutuliak view stations, shorebirds, geese, and ducks were counted.

The surveys indicate a species-rich avifauna with over 100 confirmed species of birds recorded. The greatest numbers of birds seen were geese, gulls, and ptarmigan species, representing more than half of the total number of birds observed. Geese numbers ranged from 10,000 to 20,000, with the largest numbers being seen in August and September. Large flocks of ptarmigan were seen each year in August and September, mainly at the Tuntutuliak site, with totals up to 14,782 seen in 2009.

Overall bird counts were the highest during August and September. Geese, shorebirds, waterbirds, ptarmigan, finches, cranes, and swans were generally most numerous during the fall months (August to October). Tern and jaeger numbers were highest in June and declined thereafter. Sea ducks and plovers were most numerous in July. Sparrows, warblers, and unidentified landbirds were most numerous in August. Scoter counts (i.e., black, surf, and white-winged scoters) were highest in May, June and July. Gull and loon numbers were most evenly distributed over the 5-month observation period. Harlequin ducks were seen in low numbers (11 to 19) mainly at the Fowler Island stations in May and September.

Stream-nesting Waterbird Surveys

In June 2013, additional surveys were conducted to characterize breeding waterfowl use in the stream drainages associated with the proposed mine and access road (Donlin-Jungjuk Road), and along the proposed supply barging route on the Kuskokwim River between Crooked Creek and Bethel. Table 3.12-24 summarizes the results of the Kuskokwim River portion of the survey. Figure 3.12-8 shows the geographical extent of the survey.

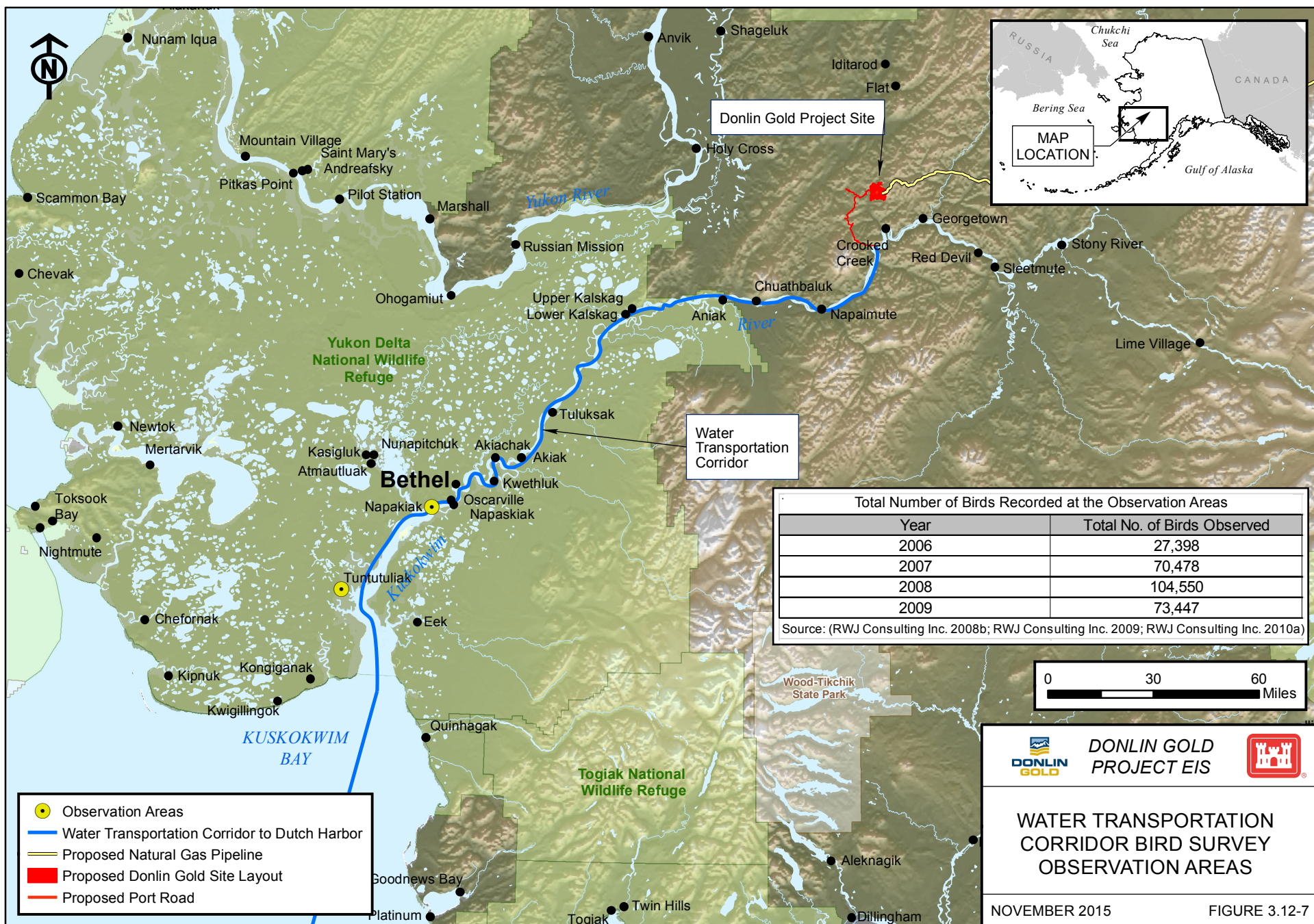
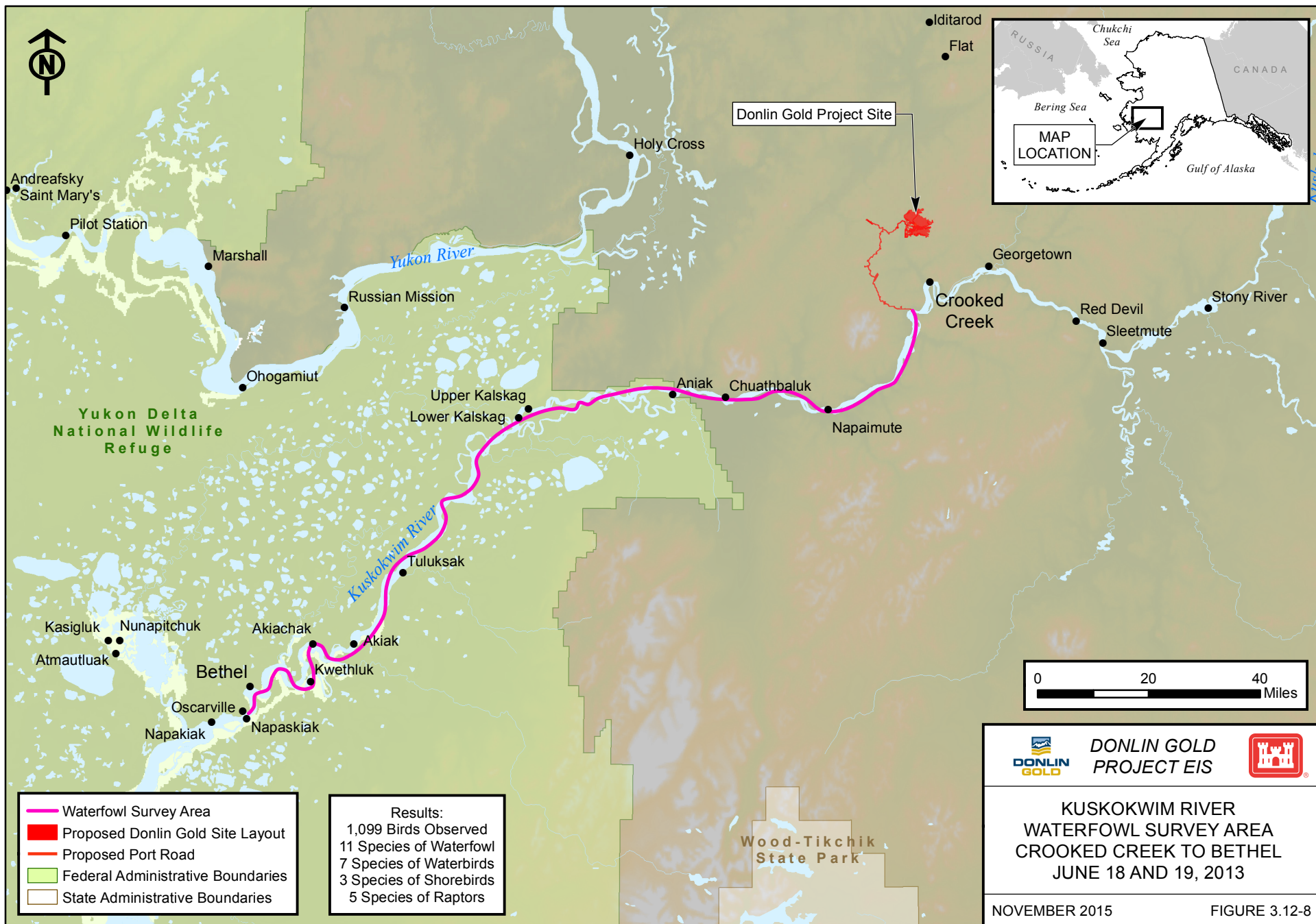


Table 3.12-24: 2013 Kuskokwim River Waterfowl Survey Results (June 18 and 19, 2013)

Species by Group	Number Observed
Waterfowl	
American Wigeon	136
Northern Pintail	82
Great White-fronted Goose	67
Mallard	66
Red-breasted Merganser	43
Northern Shoveler	41
Green-winged Teal	34
Common goldeneye	23
Canada Goose	19
Unidentified waterfowl	17
White-winged Scoter	3
Long-tailed duck	1
Waterbirds	
Arctic Tern	194
Mew Gull	73
Glaucous Gull	60
Herring Gull	58
Bonaparte's Gull	29
Glaucous-winged Gull	19
Glaucous/Glaucous-winged Gull	9
Red-throated Loon	3
Shorebirds	
Spotted Sandpiper	30
Black Turnstone	14
Semipalmated Plover	12
Raptors	
Common Raven	31
Bald Eagle	20
Osprey	10
Peregrine Falcon	4
Rough-legged Hawk	1

Source: Owl Ridge 2013.



During the 2-day (June 18 and 19), 205-mile survey of the Kuskokwim River, 1,099 individuals representing 11 species of waterfowl (ducks and geese), seven species of waterbirds (loons, gulls, and terns), three species of shorebirds, and five species of raptors (eagles, osprey, falcons, ravens) were recorded. Arctic terns (a Species of Concern) were the most common bird both in terms of observations (38) and numbers (194), followed by glaucous gulls in observations (at least 34) and American wigeons in numbers (136). An additional six groups of gulls could not be determined as to whether they were glaucous or glaucous-winged gulls. Other common species were northern pintails (82), mew gulls (73), greater white-fronted geese (67), mallards (66), glaucous gulls (at least 60), and herring gulls (58).

Landbirds

Table 3.12-25 provides a list of all landbird species identified during the Waterway Transportation Corridor Wildlife Surveys between 2006 and 2009 conducted at two locations (Fowler Island and Tuntutuliak) along the Kuskokwim River route. The most frequently seen landbirds were finches and sparrows; the species were not identified. Species of Concern are noted by shaded cells.

Table 3.12-25: Landbird Species Recorded during the Waterway Transportation Corridor Wildlife Surveys (2006-2009)

Common Name	Scientific Name	Common Name	Scientific Name
Ptarmigan (unidentified)	<i>Lagopus spp.</i>	American Pipit	<i>Anthus rubescens</i>
Northern Flicker	<i>Colaptes auratus</i>	Northern Shrike	<i>Lanius excubitor</i>
Tree Swallow	<i>Tachycineta bicolor</i>	Orange-crowned Warbler	<i>Oreothlypis celata</i>
Bank Swallow	<i>Riparia riparia</i>	Yellow Warbler	<i>Setophaga petechial</i>
Black-billed Magpie	<i>Pica hudsonia</i>	Wilson's Warbler	<i>Cardellina pusilla</i>
Common Raven	<i>Corvus corax</i>	American Tree Sparrow	<i>Spizella arborea</i>
Black-capped Chickadee	<i>Poecile atricapillus</i>	Savannah Sparrow	<i>Passerculus sandwichensis</i>
Boreal Chickadee	<i>Poecile hudsonica</i>	Dark-eyed Junco	<i>Junco hyemalis</i>
Northern Wheatear	<i>Oenanthe oenanthe</i>	Lapland Longspur	<i>Calcarius lapponicus</i>
Gray-cheeked Thrush	<i>Catharus minimus</i>	Snow Bunting	<i>Plectrophenax nivalis</i>
Swainson's Thrush	<i>Catharus ustulatus</i>	Rusty Blackbird	<i>Euphagus carolinus</i>
Varied Thrush	<i>Ixoreus naevius</i>		

Source: RWJ Consulting, Inc. 2008c, 2009, 2010b.

The 10 most common landbirds observed during eight Breeding Bird Survey routes along the Kuskokwim River were: northern waterthrush (2.5/stop), fox sparrow (1.5/stop), bank swallow (1.4/stop), yellow warbler (1.4/stop), gray-checked thrush (1.2/stop), blackpoll warbler (1.1/stop), redpoll sp. (0.8/stop), Wilson's warbler (0.75/stop), varied thrush (0.74/stop), and alder flycatcher (0.71/stop) (Harwood 2000 and 2002). The blackpoll warbler and both the gray-cheeked and varied thrush are considered Species of Concern.

Raptors

While project-specific surveys designed to target tree- or cliff-nesting raptors were not conducted along the Kuskokwim River, incidental observations of raptors were recorded during the 2006 to 2009 Waterway Transportation Corridor Wildlife Survey (RWJ Consulting, Inc. 2010b). Table 3.12-26 provides a list of all raptor and owl species identified during these surveys. The two most common raptors observed were the northern harrier (137 seen in 2009) and eagle (species not identified) with 35-40 seen annually. Raptor species less associated with aquatic habitats (hawks, falcons, and owls) were observed in smaller numbers.

Table 3.12-26: Raptor Species Recorded During the Waterway Transportation Corridor Wildlife Survey

Common Name	Scientific Name	Common Name	Scientific Name
Osprey	<i>Pandion haliaetus</i>	Golden Eagle	<i>Aquila chrysaetos</i>
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Falcon (unidentified)	NA
Eagle (unidentified)	NA	Merlin	<i>Falco columbarius</i>
Northern Harrier	<i>Circus cyaneus</i>	Peregrine Falcon	<i>Falco peregrinus</i>
Northern Goshawk	<i>Accipiter gentilis</i>	Owl (unidentified)	NA
Red-tailed Hawk	<i>Buteo jamaicensis</i>	Northern Hawk Owl	<i>Surnia ulula</i>
Rough-legged Hawk	<i>Buteo lagopus</i>	Raptor (unidentified)	NA
Hawk (unidentified)	NA		

Source: RWJ Consulting, Inc. 2008c, 2009, 2010b.

Peregrine falcon nesting surveys conducted along the Kuskokwim River between McGrath and Aniak from 2000 to 2004 observed 20 pairs of peregrines occupying breeding territories, the highest since a historical recorded low in 1976, indicating that the breeding population may still be increasing (Seppi 2007). Other raptor species recorded during the 2000 to 2004 peregrine surveys included 15 pairs of rough-legged hawks that produced 25 young, one breeding pair of bald eagles, and one pair of breeding osprey (Seppi 2007).

Waterbirds

Table 3.12-27 lists the waterbirds observed on the Kuskokwim River during the Waterway Transportation Corridor Wildlife Survey including loons, grebes, swans, geese, and ducks (RWJ Consulting Inc. 2009). The most numerous groups were geese, followed by dabbling ducks and swans. Twelve species of shorebirds were recorded on the Kuskokwim River. Wilson's snipe (*Gallinago delicata*) was the most numerous but lesser yellowlegs (*Tringa flavipes*), solitary sandpiper (*Tringa solitaria*), and spotted sandpiper (*Actitis macularia*) were also commonly observed. Terns were also common in June and July. Species of Concern are noted by shaded cells.

Table 3.12-27: Waterbird Species Recorded During the
Waterway Transportation Corridor Wildlife Survey

Common Name	Scientific Name	Common Name	Scientific Name
Red-throated Loon	<i>Gavia stellata</i>	Crane (unidentified)	<i>Grus sp.</i>
Pacific Loon	<i>Gavia pacifica</i>	Black-bellied Plover	<i>Pluvialis squatarola</i>
Common Loon	<i>Gavia immer</i>	American Golden-Plover	<i>Pluvialis dominica</i>
Yellow-billed Loon	<i>Gavia adamsii</i>	Pacific Golden-Plover	<i>Pluvialis fulva</i>
Loon (unidentified)	<i>Gavia spp.</i>	Golden-Plover (unidentified)	<i>Pluvialis spp.</i>
Red-necked Grebe	<i>Podiceps grisegena</i>	Semipalmated Plover	<i>Charadrius semipalmatus</i>
Fork-tailed Storm-Petrel	<i>Oceanodroma furcata</i>	Plover (genus Pluvialis)	<i>Pluvialis spp.</i>
Pelagic Cormorant	<i>Phalacrocorax pelagicus</i>	Greater Yellowlegs	<i>Tringa melanoleuca</i>
Cormorant (unidentified)	<i>Phalacrocorax spp.</i>	Lesser Yellowlegs	<i>Tringa flavipes</i>
Tundra Swan	<i>Cygnus columbianus</i>	Yellowlegs (unidentified)	<i>Tringa spp.</i>
Swan (unidentified)	<i>Cygnus spp.</i>	Wandering Tattler	<i>Tringa incanus</i>
Greater White-fronted Goose	<i>Anser albifrons</i>	Spotted Sandpiper	<i>Actitis macularius</i>
Snow Goose	<i>Chen caerulescens</i>	Whimbrel	<i>Numenius phaeopus</i>
Emperor Goose	<i>Chen canagica</i>	Bristle-thighed Curlew	<i>Numenius tahitiensis</i>
Brant	<i>Branta bernicla</i>	Curlew (unidentified)	<i>Numenius spp.</i>
Canada Goose and Cackling Goose ¹	<i>Branta canadensis</i> and <i>Branta hutchinsii</i>	Hudsonian Godwit	<i>Limosa haemastica</i>
Goose (unidentified)	<i>Anatidae</i>	Bar-tailed Godwit	<i>Limosa lapponica</i>
Green-winged Teal	<i>Anas crecca</i>	Godwit (unidentified)	<i>Limosa spp.</i>
Teal (unidentified)	<i>Anas spp.</i>	Black Turnstone	<i>Arenaria melanocephala</i>
Northern Shoveler	<i>Anas clypeata</i>	Ruddy Turnstone	<i>Arenaria interpres</i>
Gadwall	<i>Anas strepera</i>	Red Knot	<i>Calidris canutus</i>
American Wigeon	<i>Anas Americana</i>	Semipalmated Sandpiper	<i>Calidris pusilla</i>
Wigeon (unidentified)	<i>Anas spp.</i>	Pectoral Sandpiper	<i>Calidris melanotos</i>
Duck (unidentified)	<i>Anatidae</i>	Sharp-tailed Sandpiper	<i>Calidris acuminata</i>
Canvasback	<i>Aythya valisineria</i>	Western Sandpiper	<i>Calidris mauri</i>
Greater Scaup	<i>Aythya marila</i>	Least Sandpiper	<i>Calidris minutilla</i>
Lesser Scaup	<i>Aythya affinis</i>	Calidrid Sandpiper	<i>Calidris spp.</i>
Scaup (unidentified)	<i>Aythya spp.</i>	Rock Sandpiper	<i>Calidris ptilocnemis</i>
Spectacled Eider	<i>Somateria fischeri</i>	Sandpiper (unidentified)	<i>Scolopacidae</i>
Eider (unidentified)	<i>Somateria spp.</i>	Dunlin	<i>Calidris alpina</i>
Harlequin Duck	<i>Histrionicus histrionicus</i>	Short-billed Dowitcher	<i>Limnodromus griseus</i>
Long-tailed Duck	<i>Clangula hyemalis</i>	Wilson's Snipe	<i>Gallinago delicata</i>

Table 3.12-27: Waterbird Species Recorded During the
Waterway Transportation Corridor Wildlife Survey

Common Name	Scientific Name	Common Name	Scientific Name
Black Scoter	<i>Melanitta Americana</i>	Red-necked Phalarope	<i>Phalaropus lobatus</i>
Surf Scoter	<i>Melanitta perspicillata</i>	Phalarope (unidentified)	<i>Phalaropus spp.</i>
Scoter (unidentified)	<i>Melanitta spp.</i>	Parasitic Jaeger	<i>Stercorarius parasiticus</i>
White-winged Scoter	<i>Melanitta fusca</i>	Long-tailed Jaeger	<i>Stercorarius longicaudus</i>
Common Goldeneye	<i>Bucephala clangula</i>	Jaeger (unidentified)	<i>Stercorarius spp.</i>
Barrow's Goldeneye	<i>Bucephala islandica</i>	Bonaparte's Gull	<i>Chroicocephalus Philadelphia</i>
Goldeneye (unidentified)	<i>Bucephala spp.</i>	Mew Gull	<i>Larus canus</i>
Bufflehead	<i>Bucephala albeola</i>	Herring Gull	<i>Larus argentatus</i>
Common Merganser	<i>Mergus merganser</i>	Glaucous-winged Gull	<i>Larus glaucescens</i>
Red-breasted Merganser	<i>Mergus serrator</i>	Glaucous Gull	<i>Larus hyperboreus</i>
Merganser (unidentified)	<i>Mergus spp.</i>	Sabine's Gull	<i>Xema sabini</i>
Sandhill Crane	<i>Grus Canadensis</i>	Gull (unidentified)	<i>Laridae</i>
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>	Arctic Tern	<i>Sterna paradisaea</i>
Dowitcher (unidentified)	<i>Limnodromus spp.</i>	Tern (unidentified)	<i>Laridae spp.</i>

Notes:

1 Due to the difficulty distinguishing these species, they will be considered together.

Source: RWJ Consulting, Inc. 2008c, 2009, 2010b.

The avian studies conducted at two locations along the Kuskokwim River route documented pulses of birds that moved through the Kuskokwim River Delta on an annual basis as a result of nesting, staging and migratory behavior, which varied by species group.

Kuskokwim Bay

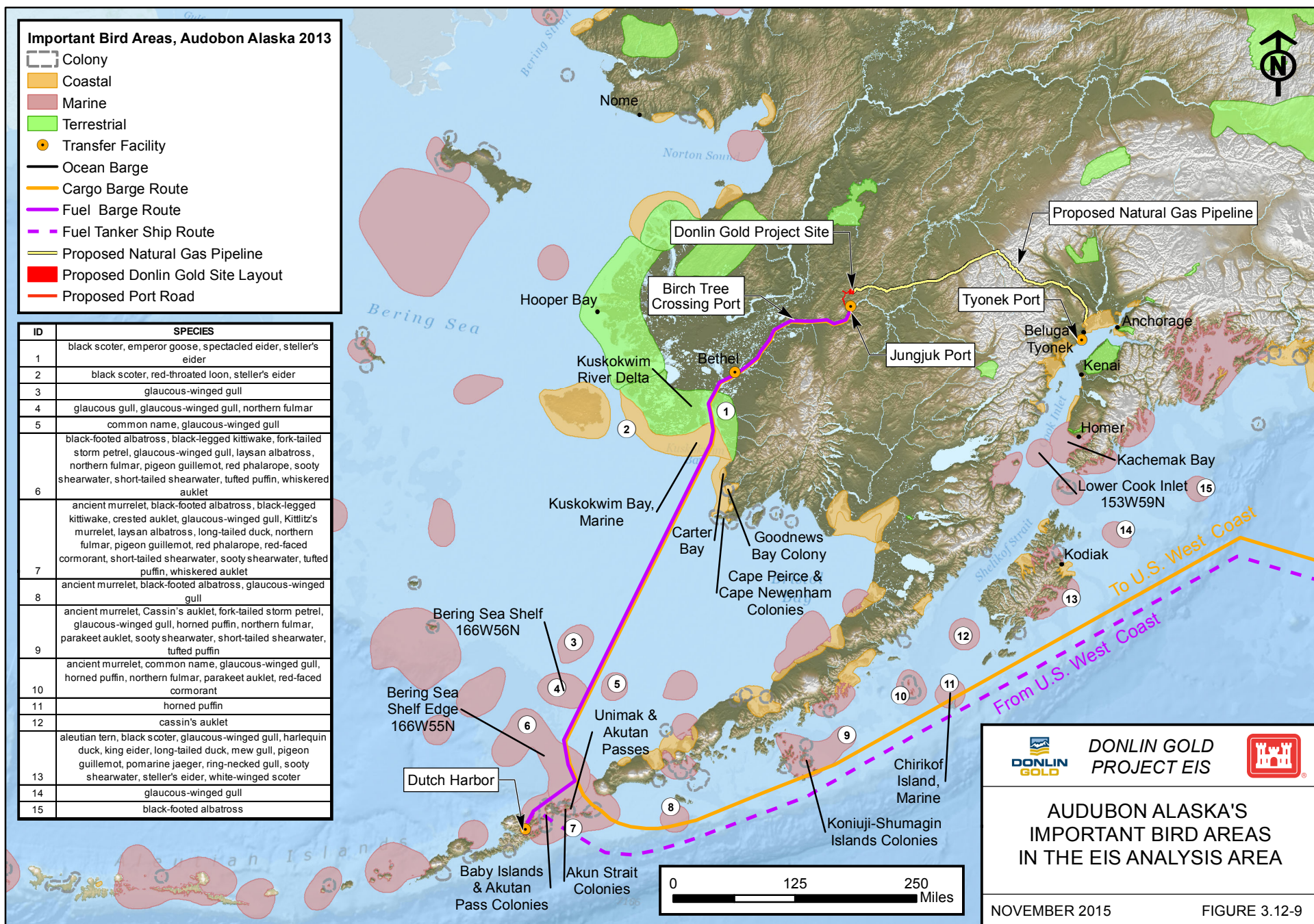
There are several Important Bird Areas designated by the National Audubon Society in the EIS Analysis Area (Figure 3.12-9) (Audubon 2015, FWS 2014d). The Kuskokwim Bay marine area is an offshore area about 30 km wide that stretches along most of the Nelson Island coast (except for its northern portion), and includes Cape Avinov waters, barrier islands, and Kuskokwim Bay. In this area, close to 65,000 Steller's eider have been seen at one time, many more may be using the area due to turnover during migration in spring (up to 90 percent of the world population seasonally). It is also a migration corridor for other sea ducks, primarily king eider, common eider, and long-tailed duck.

Kuskokwim Shoals is an important staging and feeding area for waterfowl during spring and fall migration (Larned and Tiplady 1996). The area is also known as an important molting area for seaduck species, a migration funneling point for emperor geese, and the location of one of the largest northern eelgrass beds. A portion of the area is designated as critical habitat for Steller's eider for both spring staging and fall molting.

Important Bird Areas, Audobon Alaska 2013

- Colony
- Coastal
- Marine
- Terrestrial
- Transfer Facility
- Ocean Barge
- Cargo Barge Route
- Fuel Barge Route
- Fuel Tanker Ship Route
- Proposed Natural Gas Pipeline
- Proposed Donlin Gold Site Layout
- Proposed Port Road

ID	SPECIES
1	black scoter, emperor goose, spectacled eider, steller's eider
2	black scoter, red-throated loon, steller's eider
3	glaucous-winged gull
4	glaucous gull, glaucous-winged gull, northern fulmar
5	common name, glaucous-winged gull
6	black-footed albatross, black-legged kittiwake, fork-tailed storm petrel, glaucous-winged gull, laysan albatross, northern fulmar, pigeon guillemot, red phalarope, sooty shearwater, short-tailed shearwater, tufted puffin, whiskered auklet
7	ancient murrelet, black-footed albatross, black-legged kittiwake, crested auklet, glaucous-winged gull, Kittlitz's murrelet, laysan albatross, long-tailed duck, northern fulmar, pigeon guillemot, red phalarope, red-faced cormorant, short-tailed shearwater, sooty shearwater, tufted puffin, whiskered auklet
8	ancient murrelet, black-footed albatross, glaucous-winged gull
9	ancient murrelet, Cassin's auklet, fork-tailed storm petrel, glaucous-winged gull, horned puffin, northern fulmar, parakeet auklet, sooty shearwater, short-tailed shearwater, tufted puffin
10	ancient murrelet, common name, glaucous-winged gull, horned puffin, northern fulmar, parakeet auklet, red-faced cormorant
11	horned puffin
12	cassin's auklet
13	aleutian tern, black scoter, glaucous-winged gull, harlequin duck, king eider, long-tailed duck, mew gull, pigeon guillemot, pomarine jaeger, ring-necked gull, sooty shearwater, steller's eider, white-winged scoter
14	glaucous-winged gull
15	black-footed albatross



DONLIN GOLD
PROJECT EIS



AUDUBON ALASKA'S
IMPORTANT BIRD AREAS
IN THE EIS ANALYSIS AREA

NOVEMBER 2015

FIGURE 3.12-9

The area from the mouth of the Kuskokwim River north to the Seward Peninsula supports some of the highest local breeding densities of shorebirds in the world (Meltotte et al 2007). In addition, Kuskokwim Bay is an important fall staging area for king eiders based on birds implanted with satellite transmitters (Oppel et al. 2008). King eiders undergoing wing molt were also located in Kuskokwim Bay (Phillips et al. 2006).

Marine Waters (Kuskokwim Bay to Dutch Harbor)

The proposed shipping route from Dutch Harbor through Bristol Bay to the mouth of Kuskokwim Bay is approximately 460 miles long, and is used year-round by many species of migratory birds. Gill et al (1978) summarized data on the timing, routes, patterns, and magnitudes of bird migrations in Alaska Outer Continental Shelf areas in Lower Cook Inlet, northeast and western Gulf of Alaska, Kodiak Basin, Aleutian Shelf and Southern Alaska Peninsula, and SE Bering Sea and Bristol Bay. They estimated that these areas contain some 23 million marine birds of 30 species, with the Bering Sea supporting the greatest number of breeding seabirds, approximately 48 percent of all species documented in Alaska. The marine portion of the proposed barge transportation route crosses marine migration routes used by many species of waterfowl and seabirds including; emperor goose, brant, Steller's eider, common eider, king eider, black scoter, dunlin and western sandpiper. Many of these are considered Species of Concern. These migration routes are generally located along the coastline, although some species travel more inland during the spring migration. Birds known to winter along the route include pelagic cormorant, black-legged kittiwake, common and thick-billed murres, and tufted puffin, with wintering areas along the coasts of the southern Alaska Peninsula and Aleutian Islands (Gill et al 1978). Estimated numbers of seabirds nesting in the southern Bering Sea Region show the most abundant species to be black-legged and red-legged kittiwakes, common and thick-billed murres, parakeet, crested, and least auklets, horned and tufted puffins, northern fulmar, pelagic cormorant, and glaucous-winged gull (Gill et al 1978). A large portion of the marine transportation route is mapped as a major summer concentration area for sooty and short-tailed shearwaters (Gill et al 1978).

The route also crosses or comes close to 13 marine areas designated by the National Audubon Society as Important Bird Areas. These areas are shown on Figure 3.12-9.

3.12.5.1.3 Pipeline

The proposed pipeline includes the 315-mile route from Cook Inlet near Beluga to the proposed mine site, terminal facilities, construction access areas, and material sources.

As described in Section 3.10, Vegetation, the proportion of habitat types in the pipeline area (shown in Table 3.10-10) differs from that at the mine site. The pipeline area has more shrub habitat (41 percent) than the mine site, and a roughly equal mix of mixed forest and coniferous forest (25 percent each) compared to the coniferous forest-dominated habitat at the mine site.

The proposed gas pipeline corridor crosses four ecoregions. From west to east these areas are the Kuskokwim Mountains, Tanana-Kuskokwim Lowlands, the Alaska Range, and the Cook Inlet Basin. The composition of bird communities along the route is expected to vary by location.

ADF&G's webpage (ADF&G 2014c) reports that the Susitna Flats State Game Refuge has spectacular spring and fall concentrations of migrating waterfowl and shorebirds, including

several thousand lesser sandhill cranes and upwards of 8,000 swans. Spring migration of ducks, geese and swans number well in excess of 100,000 birds (ADF&G 2014c).

The Susitna Flats area, an expansive coastal lowland on the northwest side of Cook Inlet that extends from Threemile Creek (north of the village of Tyonek) east to Pt. McKenzie, has been designated as an Important Bird Area by the National Audubon Society. The Audubon Society's description of the site (National Audubon Society 2013) reports that total daily counts of waterfowl can exceed 36,000 birds during spring migration. Total high counts for all shorebird taxa using the site exceed 30,000 birds. The diversity of species is among the highest at any site in Cook Inlet, but overall numbers of any one species, except for rock sandpipers and Hudsonian godwits (both considered Species of Concern), was relatively low. The site's principal importance is to the dominant race of the rock sandpiper (*Calidris ptilocnemis ptilocnemis*), of which virtually the entire population resides on the area between early October and late April.

Landbirds

Donlin Gold has not conducted point-count surveys along the pipeline route as have been conducted in the vicinity of the proposed mine site. Therefore bird density estimates were obtained from a published report of a survey in the EIS Analysis Area. Hinkes and Engels (1989) estimated bird densities on unburned and recently burned sites at the Bear Creek and Farewell Burn areas located approximately 40 km southeast of McGrath, between the western slopes of the Alaska Range and the South, Windy, and Middle Forks of the Kuskokwim River. This area is in the vicinity of MP 150 of the proposed pipeline. The report provides density estimates for 16 of the 18 most common species observed during the surveys conducted at the mine site and transportation areas. Table 3.12-28 presents these habitat-specific density estimates. Species of Concern are noted by shaded cells.

Table 3.12-28: Estimated Density of 16 Bird Species Observed in the Vicinity of the Proposed Pipeline by Habitat

Habitat	Species	Estimated Density (birds/acre)
Forested-Deciduous/Mixed	Fox sparrow	0.24
	Redpoll sp.	0.12
	Swainson's thrush	0.53
	White-crowned sparrow	0.00
	Ruby-crowned kinglet	0.24
	American robin	0.06
	Gray-cheeked thrush	0.03
	Yellow-rumped warbler	0.30
	Dark-eyed junco	0.30
	Varied thrush	0.06
	Gray jay	0.18
	Olive-sided flycatcher	0.18
	Alder flycatcher	0.35
	White-winged crossbill	0.00
	Orange-crowned warbler	0.00
	Blackpoll warbler	0.24

Table 3.12-28: Estimated Density of 16 Bird Species Observed in the Vicinity of the Proposed Pipeline by Habitat

Habitat	Species	Estimated Density (birds/acre)
Needleleaf Forest Needleleaf Forest (cont'd)	Fox sparrow	0.00
	Redpoll sp.	0.03
	Swainson's thrush	0.18
	White-crowned sparrow	0.05
	Ruby-crowned kinglet	0.21
	American robin	0.03
	Gray-cheeked thrush	0.15
	Yellow-rumped warbler	0.30
	Dark-eyed junco	0.17
	Varied thrush	0.13
	Gray jay	0.15
	Olive-sided flycatcher	0.00
	Alder flycatcher	0.00
	White-winged crossbill	0.03
	Orange-crowned warbler	0.00
	Blackpoll warbler	0.00
Shrub	Fox sparrow	0.00
	Redpoll sp.	0.18
	Swainson's thrush	0.08
	White-crowned sparrow	0.40
	Ruby-crowned kinglet	0.00
	American robin	0.03
	Gray-cheeked thrush	0.09
	Yellow-rumped warbler	0.00
	Dark-eyed junco	0.32
	Varied thrush	0.00
	Gray jay	0.00
	Olive-sided flycatcher	0.00
	Alder flycatcher	0.00
	White-winged crossbill	0.00
	Orange-crowned warbler	0.16
	Blackpoll warbler	0.00

Source: Hinkes and Engels 1989.

Ruthrauff (et al 2007) conducted an inventory of birds in comparable upland habitats in Katmai and Lake Clark National Parks and Preserves and identified 116 species (21 waterfowl, 4 grouse/ptarmigan, 3 loons, 2 grebes, 10 raptors, 1 crane, 18 shorebirds, 7 gulls/terns/jaegers, 2 owls, 3 woodpeckers, and 45 landbirds). Golden-crowned sparrows were detected at one-and-one-half times the rate of any other species. Other commonly-detected species were fox sparrow, American pipit, and redpoll species.

Raptors

In 2010, 2011, and 2012 Donlin Gold conducted aerial raptor surveys focused on suitable nesting habitats along the pipeline route. The survey area extended 1-mile on each side of the 315-mile pipeline route. Two biologists and a helicopter pilot conducted the raptor surveys from late May to early June to coincide with raptor nesting activity in the region prior to vegetation leaf out. The survey entailed scanning the vegetation within the study area boundary from a distance in the aircraft, then concentrating survey efforts on suitable nesting habitats. All nest sites identified in the study area in 2011 were revisited in 2012. An R-44 helicopter was flown at an altitude of approximately 250 feet (75 meters) aboveground to tree-top level (Fuller and Mosher 1987) with flight speeds ranging from 20 to 50 miles-per-hour (32 to 81 kilometers-per-hour) depending on the topography, vegetation and visibility. The survey was completed during the breeding season after the majority of species had finished courtship and were either incubating eggs or rearing young, allowing biologists to determine if nests were occupied or unoccupied. If a nest was observed, the helicopter maneuvered to the nest and hovered in a position where status and species could be determined with better accuracy. Table 3.12-29 lists the raptor species observed each year of the survey.

Nests were commonly found in mature cottonwood (*Populus balsamifera*) and black (*Picea mariana*) and white (*Picea glauca*) spruce trees along riparian corridors. Cliff nest locations are also common in the study area; 27% of all raptor nests located in 2011 were constructed on a cliff.

Raptor species generally select nesting sites that are relatively inaccessible and close to areas with a sufficient prey base to feed their young. All of the occupied raptor nests identified in 2010 and 2011 were within 800 m (0.5 mile) of a river, creek, or stream (Table 3.12-15). This proximity is attributed to the location of suitable nest habitat (e.g., mature trees and cliffs) associated with riparian areas.

Figure 3.12-10 and Figure 3.12-11 show the location of the raptor nests observed in the study area in 2012.

Waterbirds

Much of the habitat found along the pipeline route west of the Alaska Range is not favorable to heavy use by waterbirds. However, habitats found on the east side of the Alaska Range within the Cook Inlet drainage are suitable for waterbird use. The Susitna Flats State Game Refuge, which encompasses the first 5 miles of the pipeline route, contains habitat that is used by as many as 100,000 waterfowl during peak times of the year (ADF&G 2014c) (Figure 3.12-12). Species documented on the Susitna Flats State Game Refuge include mallards, northern pintails, Canada geese, tule white-fronted geese, lesser sandhill cranes, and swans. Phalaropes, dowitchers, godwits, whimbrels, snipes, yellowlegs, sandpipers, plovers, and dunlins are among the most abundant of shorebirds in the Refuge (Clausen et al. 1988).

Surveys conducted along the pipeline route were designed to locate raptors, but tundra and trumpeter swan nests were also recorded. Figure 3.12-13 shows these locations, as well as locations of observations from FWS data (FWS 2005b).

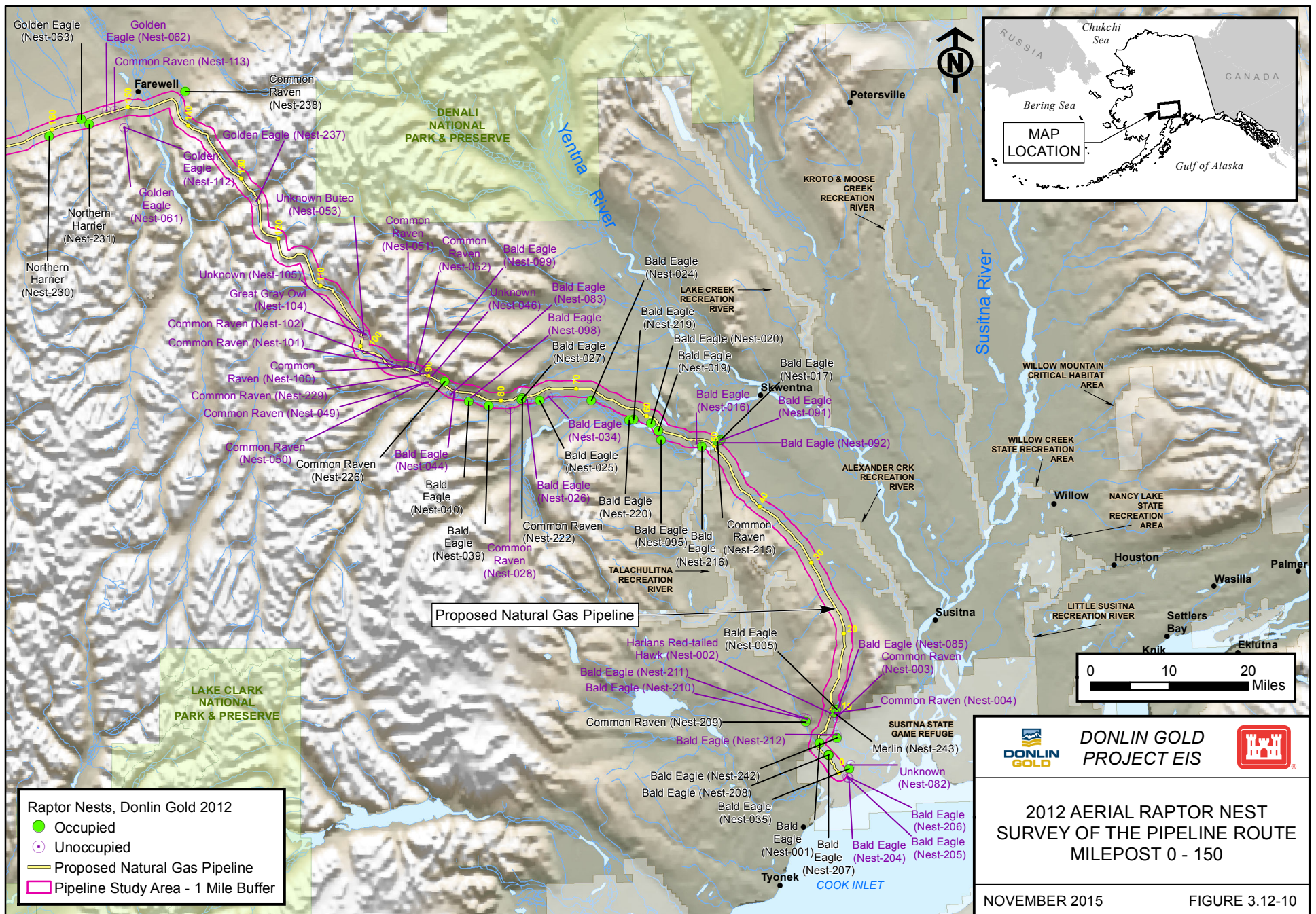
Table 3.12-29: Raptor Nests Observed on the Proposed Pipeline Route During the 2010, 2011, and 2012 Aerial Raptor Surveys in Order of Abundance

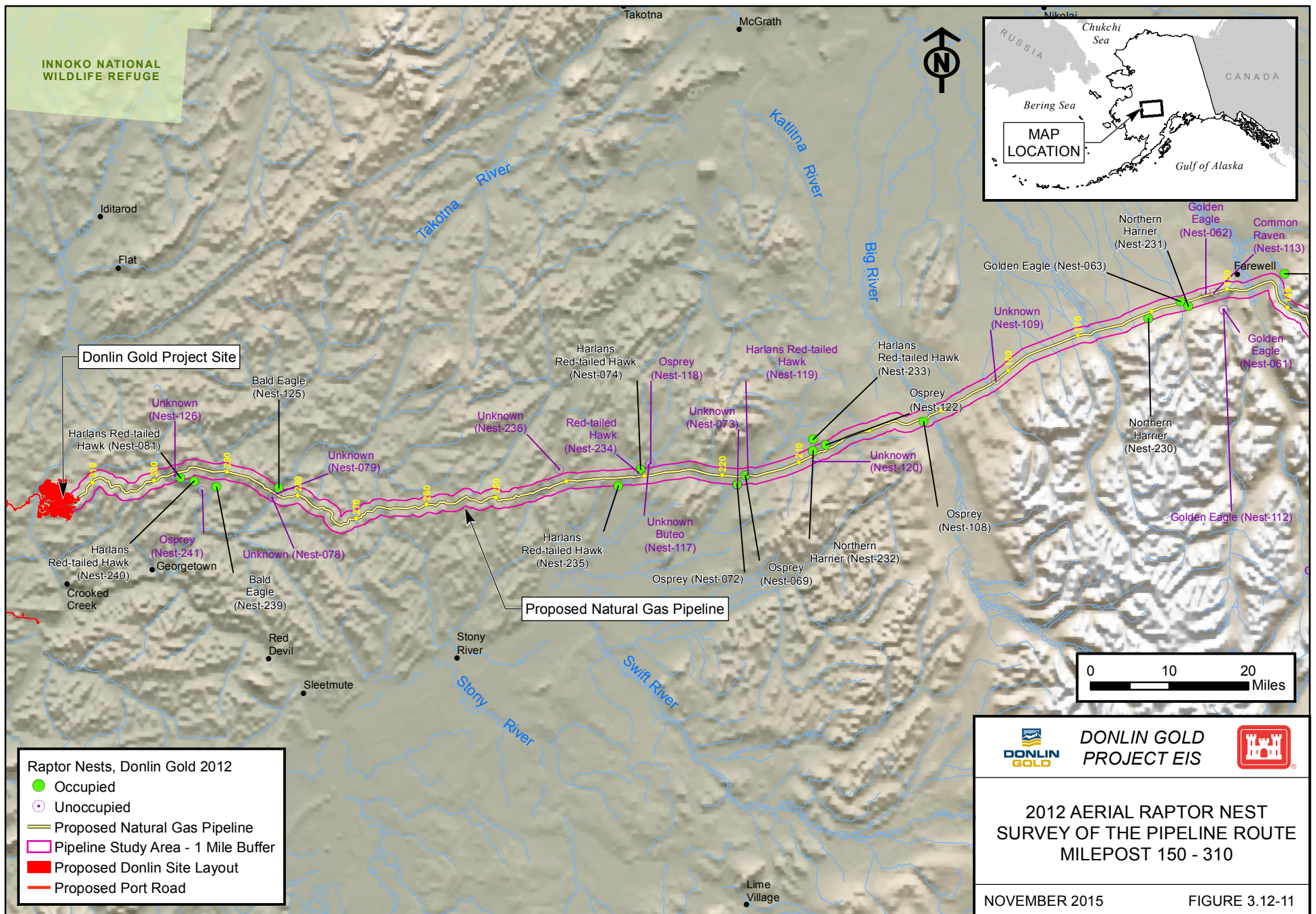
Species	2010		2011		2012		Totals
	Occupied	Unoccupied	Occupied	Unoccupied	Occupied	Unoccupied	
Bald Eagle	5	10	8	10	12	9	54
Unidentified Raptor	0	0	0	21	0	8	29
Harlan's Hawk	5	0	7	0	2	3	17
Common Raven	1	0	2	0	3	11	17
Golden Eagle	4	2	0	3	1	3	13
Osprey	1	0	3	0	4	0	8
Northern Harrier	0	0	3	0	3	0	6
Peregrine Falcon	0	0	0	6	0	0	6
Unidentified Accipiter	0	5	0	0	0	0	5
Great Gray Owl	3	0	0	1	0	1	5
Unidentified Buteo	0	2	0	1	0	1	4
Merlin	0	0	1	0	1	0	2
Great Horned Owl	1	0	0	0	0	0	1
Totals:	20	19	24	42	26	36	167

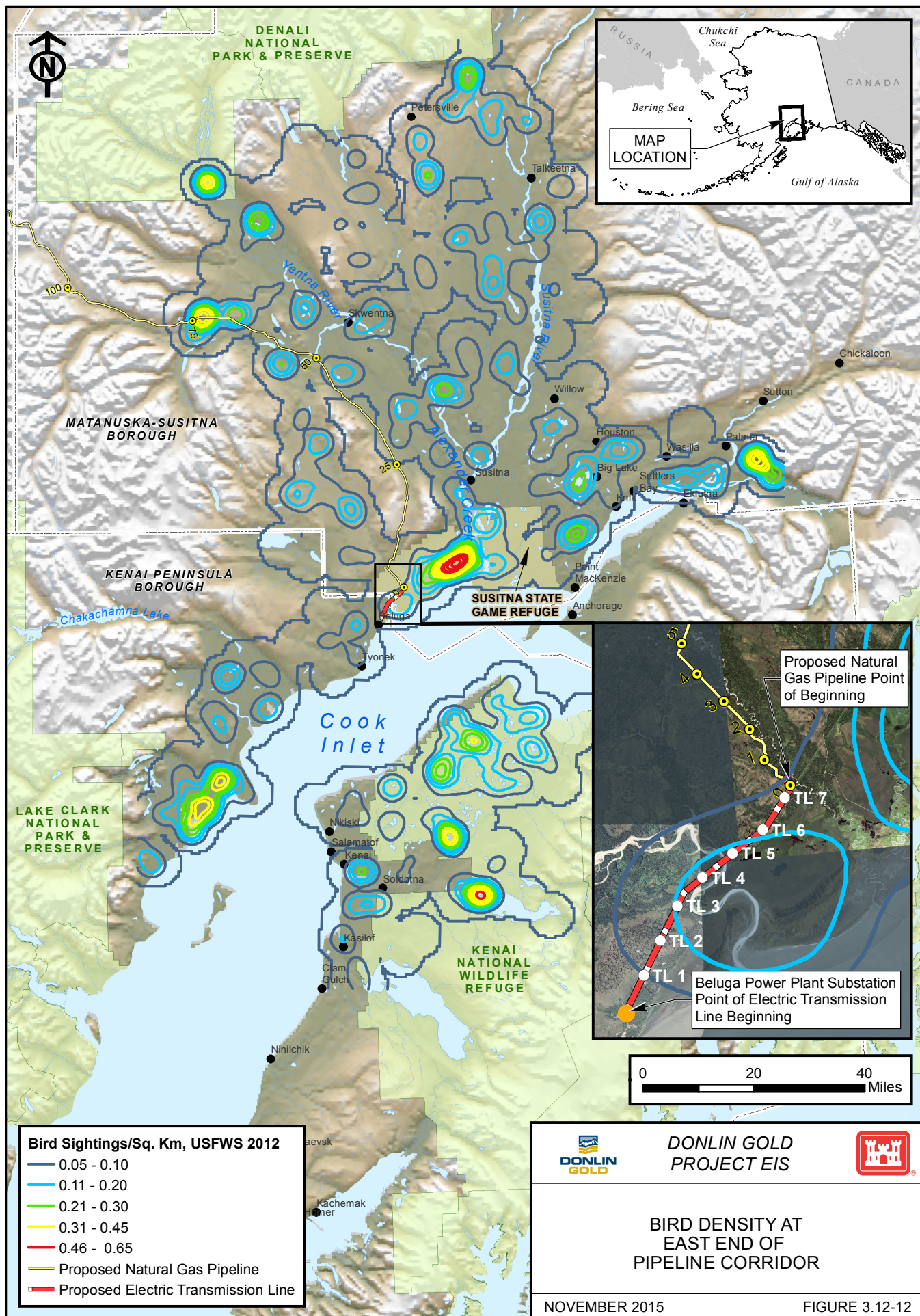
Source: ARCADIS 2012b.

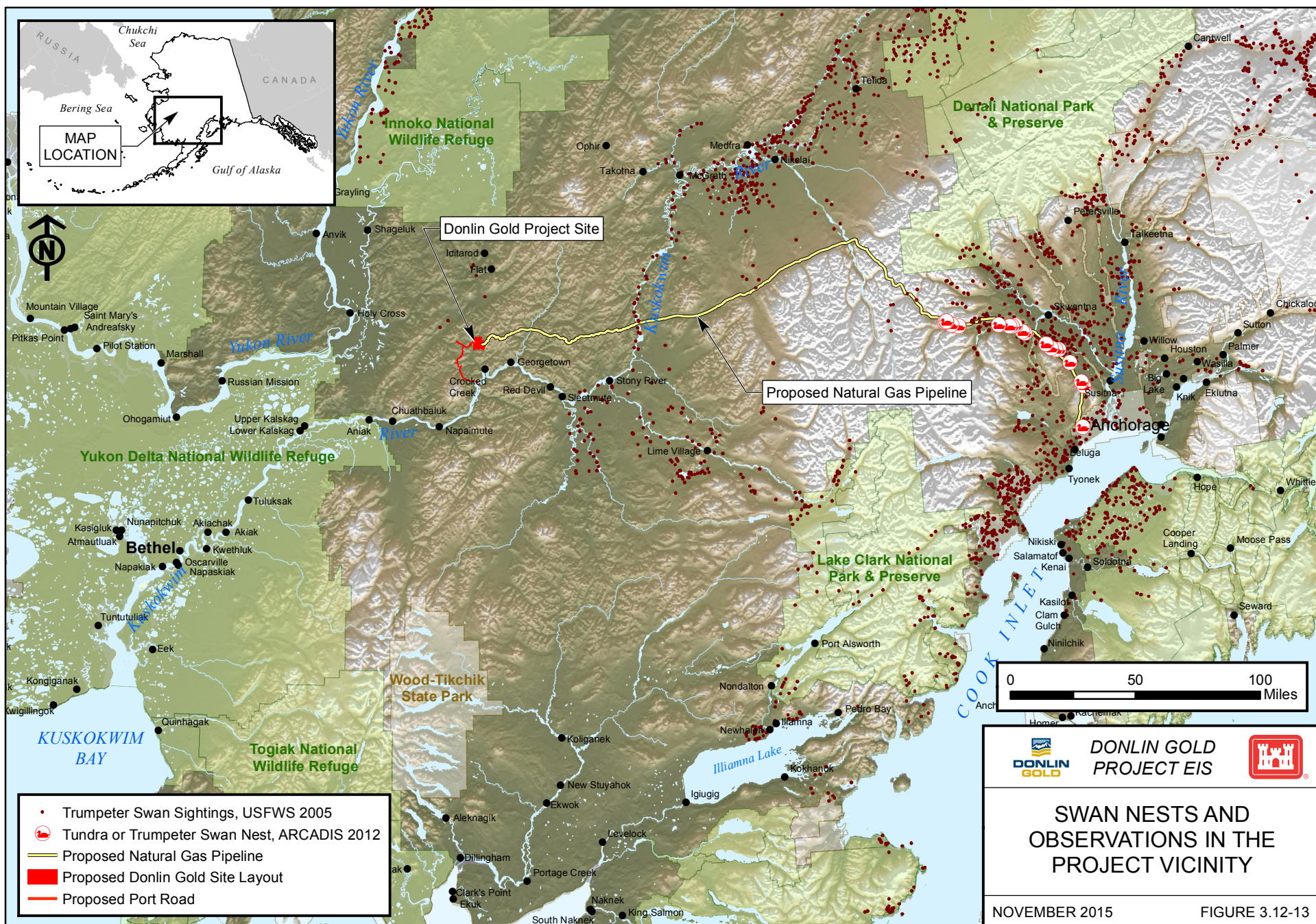
3.12.5.1.4 SPECIES OF CONCERN

Several federal and state agencies and non-profits have created Alaska-specific lists of bird species warranting special concern or conservation including the BLM, ADF&G, USGS, FWS, and Audubon Alaska. Table 3.12-30 lists 31 such species observed or otherwise detected within the EIS Analysis Area. This table shows these species by project location and includes a summary of the reason for concern for the species to aid in the discussion of impacts. For many of these species a large portion of their population either breeds or migrates through the Project Area; these are shaded in the table. Several species are known to breed at higher densities in the EIS Analysis Area than have been recorded elsewhere in Alaska or are known to concentrate in the Project Area for migration or molting, these are noted in the table with bold text. The four species that have both a substantial portion of their populations in the Project Area, and known to occur there in high numbers (black scoter, Hudsonian godwit, black turnstone, and rock sandpiper) are further described below.









DONLIN GOLD PROJECT EIS

SWAN NESTS AND OBSERVATIONS IN THE PROJECT VICINITY

Table 3.12-30: Species of Concern Detected in the Project Area

Common Name	Reason for Concern ¹	Mine Site and the Angyaruaq (Jungluk) Port Road.	BTC Port Site and Road	Kuskokwim River – Below Napaskiak	Kuskokwim River – Above Napaskiak	Pipeline
Waterbirds						
Red-throated Loon	The population in Alaska declined substantially between 1977 and 1993, and has not rebounded. Birds that winter in Southeast Asia may suffer PCB-related reproductive losses.			X	*	
Yellow-billed Loon	Fall subsistence surveys indicate unsustainable levels of harvest.			X		
Emperor Goose	Most of the world population breeds on the Yukon-Kuskokwim Delta, and spends spring and fall staging periods on the Alaska Peninsula. These birds declined from an estimated 139,000 in 1964 to 42,000 in 1986, for reasons that are not well understood. Populations since are stable or increasing.			X		
Spectacled Eider	Federally listed as threatened following declines of more than 90 percent in Western Alaska. For the last decade they have been slowly recovering. Virtually the entire global population winters in Alaska waters; tens of thousands of birds congregate in ice-free waters south of St. Lawrence Island.			X		
Black Scoter	Surveys of the western population indicate a substantial decline over the last 7–15 years. Reasons for the long-term decline are unknown. Black Scoters molt in large flocks from Cape Romanzof, Angyoyaravak Bay, Kuskokwim Bay, and south in bays to Cape Pierce (Palmer 1976, King and Dau 1981).			X		
Harlequin Duck	Population trends cannot be reliably determined for western Harlequin Ducks because of insufficient geographic coverage and time series data (Sea Duck Joint Ventures 2003). Winter surveys suggest stable numbers in major areas (FWS in Sea Duck Joint Venture 2003).			X		
American Golden Plover	Apparently declining, possibly due to habitat loss on wintering grounds in South America and changing agricultural practices on migratory staging grounds in the American Midwest. Declining in North America with estimates based on mark recapture or other systematic efforts (Morrison et al. 2006).	X	X	X		
Solitary Sandpiper	A dispersed nester in boreal woodland forests, this subspecies has a relatively small population. Likely has declined due to habitat loss and alteration of boreal forests and drying and loss of wetlands.			X	*	*

Table 3.12-30: Species of Concern Detected in the Project Area

Common Name	Reason for Concern ¹	Mine Site and the Angyaruaq (Jungluk) Port Road.	BTC Port Site and Road	Kuskokwim River – Below Napaskiak	Kuskokwim River – Above Napaskiak	Pipeline
Lesser Yellowlegs	This species is declining rapidly based on Breeding Bird Survey data. Causes may include drying of boreal wetland habitat on its breeding grounds as a result of recent climate change and habitat degradation on wintering grounds in Latin America.			X	*	*
Whimbrel	Drastic reduction of the intertidal mangrove habitat that Whimbrels depend on in Latin America wintering grounds is a concern.	58 birds total, 0.02 birds/acre	X	X	*	
Bristle-thighed Curlew	A rare species with a global population estimate of only 10,000 birds. Breeding grounds restricted to two relatively small areas in western Alaska. Populations may be negatively affected by factors on the nonbreeding range.	X		X		
Hudsonian Godwit	This species is a long-distance migrant, moving from a few Arctic breeding sites to a small wintering range in southern South America. The Alaska population is small, genetically distinct, and relatively vulnerable. Greatest threat thought to be gas and oil development in Cook Inlet, which has the majority of the Alaska population.			X	*	*
Bar-tailed Godwit	This subspecies breeds only in Alaska, wintering in Australia and New Zealand. Threats include habitat degradation and hunting at northward migration stopover sites along the Yellow Sea in eastern Asia.			X		
Dunlin	The pacifica subspecies nests in western and northern Alaska. Both subspecies are relatively abundant, but appear to have undergone substantial declines.			X		
Black Turnstone	The entire global population of Black Turnstones breeds only on the coast of western Alaska, 85% on the central Yukon-Kuskokwim Delta.			X		
Red Knot	All of the North American population migrates through Alaska. Conservation concerns include unsustainable hunting on the wintering grounds and low reproductive success on the breeding range.			X		
Western Sandpiper	Conservation concerns include: a tendency to concentrate in a limited number of locations during migration and winter, substantial habitat loss/degradation on wintering grounds, and a restricted breeding range in western Alaska.			X		*

Table 3.12-30: Species of Concern Detected in the Project Area

Common Name	Reason for Concern ¹	Mine Site and the Angyaruaq (Jungluk) Port Road.	BTC Port Site and Road	Kuskokwim River – Below Napaskiak	Kuskokwim River – Above Napaskiak	Pipeline
Rock Sandpiper	Restricted distributions of the multiple subspecies that have evolved in the region, two of which breed exclusively in Alaska. Either the entire or majority of the three populations winter in Alaska. None of the three populations is large, ranging in size from 25,000 to 75,000 individuals.			X		*
Short-billed Dowitcher	Pesticide use and the local destruction of migratory habitat, especially in the Midwest, have contributed to the recent decline in Short-billed Dowitchers. The boreal breeding grounds of the Short-billed Dowitcher have been seriously degraded and fragmented in areas where energy and logging companies have commercial access.	0.00004 birds/acre		X	*	*
Arctic Tern	Reduction in numbers in the southern part of their range, much of this is due to lack of food.			X	*	*
Raptors						
Golden Eagle	Loss of undisturbed habitat seems the most serious threat to maintaining healthy populations of golden eagles. They are also particularly susceptible to electrocution from power lines due to their large wingspan, and poisoning from ingesting poisoned food meant for coyotes.	0.0004 birds/acre	X	X	*	X
Gyrfalcon	Degradation of nesting habitat and disturbance due to large-scale development is mostly a localized threat in Alaska, but loss of wintering habitat is more extensive and could pose future difficulties.	0.00007 birds/acre		X		X
Peregrine Falcon	Degradation of nesting habitat and disturbance due to large-scale development is mostly a localized threat in Alaska, but loss of wintering habitat is more extensive and could pose future difficulties.	0.002 birds/acre	X	X	*	X
Short-eared Owl	Development and the disturbance that accompanies it does occur within species' range in the state. Reductions in prey abundance and wetland drying adversely affect this species.					X
Landbirds						
Olive-sided Flycatcher	This species has a low reproductive rate for a songbird. Populations are declining 3–3.5% annually in North America. A suspected cause is loss of forested habitat in South American wintering grounds.	0.01 bird/acre detected	X		*	*

Table 3.12-30: Species of Concern Detected in the Project Area

Common Name	Reason for Concern ¹	Mine Site and the Angyaruaq (Jungluk) Port Road.	BTC Port Site and Road	Kuskokwim River – Below Napaskiak	Kuskokwim River – Above Napaskiak	Pipeline
Varied Thrush	This species is abundant, but declining by 3%–4% per year. Threats include loss of mature forest due to logging, especially in the southern portion of its range.	0.01 birds/acre detected	X	X	*	*
Gray-cheeked Thrush	A pronounced decline was observed during the 12 year (1991-2003) spring netting period at Creamer's Field Migration Station in Fairbanks.					0.03 birds/acre detected *
Blackpoll Warbler	Alaska population has declined by 54% since 1980 (Sauer et al. 2005). Alaska BBS data from 1980-2007 indicate a substantial population decline of 3.0% per year ($P=0.00$, $n = 56$, $c=3$). Cause of the decline is unknown. Breeding density highest in riparian habitats in western Alaska (McCaffery 1996, Harwood 2002).	0.07 birds/acre detected	X	X	*	*
Rusty Blackbird	The Rusty Blackbird declined from an estimated 13 million birds in 1965 to only 2 million birds today. Loss of wintering habitat plays a role. Other possible factors in the decline are acid rain and mercury accumulation on the breeding grounds, and alterations in boreal forest wetlands associated with climate change.	0.0001 birds/acre		X	*	*
Total Number of Species		12		24	14	16

Notes:

Shading indicates species with a substantial portion of their population either breeding or migrating through the EIS Analysis Area. Bolded common names indicate species that are known to breed at higher densities in the EIS Analysis Area than have been recorded elsewhere in Alaska or are known to concentrate in the Project Area for migration or molting.

X = Species detected from the surveys described in ARCADIS 2012d,e or RWJ Consulting 2009.

* = Species detected based on other surveys or information.

¹ Species of Concern are based on evaluations by the Alaska Department of Fish and Game (2006b), Alaska Shorebird Group (2008), Audubon Alaska (Kirchhoff and Padula 2010), AKNHP (2015d), Boreal Partners in Flight (in prep.), or the U.S. Fish and Wildlife Service (2008).

Black Scoter

Black scoters breed in the Project Area and molt in large flocks in Kuskokwim Bay (AKNHP 2015b). The marine portion of the proposed barge route crosses black scoter migration and wintering areas. Currently, the FWS (2005) estimates that there are about 200,000 black scoters in Alaska, however, the population in western Alaska has declined by about 50 percent since aerial surveys were begun in the 1950s and the reason for the decline is unknown (FWS 2005b).

This species was seen frequently during the Waterway Transportation surveys conducted from viewing stations along the Kuskokwim River near Fowler Island and Tuntutuliak. They were seen from all viewing stations during all three years of surveys (2007, 2008, and 2009). The following count information is summarized from the final survey report (RWJ Consulting 2010b). Counts of all three scoter species (black, surf, and white-winged) were highest in May through July. For black scoters, a total of 1,024 individuals were observed at the viewing stations from May to September 2009. The highest number of black scoters observed at all viewing stations on a single day was 124 birds on June 26, 2009; in 2008, it was 126 birds on June 3, 2008.

The black scoter is one of the most prized birds for subsistence for its high meat/fat content and flavor. The FWS (2005) notes that subsistence hunters have told biologists that during the 1980s, groups of 100 or more black scoters were seen migrating up the Kuskokwim River in the spring. In recent years, hunters report that smaller groups of black scoters (e.g., 10 to 20 individuals) are now more typically seen on the Kuskokwim River. The FWS (2005b) estimates that approximately 7,000 black scoters are harvested each year in western Alaska. As such, their harvest, as a proportion of the total estimated population size, is higher than for any other duck in the Yukon-Kuskokwim Delta system.

Hudsonian Godwit

This species is an uncommon breeder in the Yukon Kuskokwim Delta region, but hundreds are known to gather for fall staging on the shores of Kuskokwim Bay and Cook Inlet (AKNHP 2015b). One individual was seen during the Waterway Transportation Route surveys at one of the Tuntutuliak viewing stations in 2008 (RWJ Consulting 2009).

Black Turnstone

The majority (85 percent) of the population of black turnstones breeds in the central Yukon Kuskokwim Delta (Handel and Gill 1992). This species was seen from both the Fowler Island and Tuntutuliak viewing stations during all 3 years of the Waterway Transportation Route surveys. A total of 67 individuals were observed.

Rock Sandpiper

The rock sandpiper breeds only in Alaska from the Seward Peninsula south throughout the Yukon-Kuskokwim Delta, Alaska Peninsula, and Aleutian Archipelago and among islands of the western Gulf of Alaska (AKNHP 2015b). In autumn, this species concentrates in estuaries to molt. Tens of thousands may gather at single estuaries, especially along the Yukon Delta and Alaska Peninsula coast (Gill et al. 2002).

During the three years of Waterway Transportation Route surveys, 11 rock sandpipers were seen from Tuntutuliak viewing stations in 2008 and 4 were seen in 2009.

Data from the Yukon Delta National Wildlife Refuge breeding bird surveys (Harwood 2000 and 2002) provides further evidence that several Species of Concern are nesting in the area (Table 3.12-31).

Table 3.12-31: Average Number of Species of Concern Counted per Survey Stop along Eight Breeding Bird Survey Routes on the Kuskokwim River

Species	Birds/stop	Species	Birds/stop
Blackpoll Warbler	1.11	Short-billed Dowitcher	0.03
Varied Thrush	0.74	Whimbrel	0.01
Rusty Blackbird	0.15	Red-throated Loon	0.004
Lesser Yellowlegs	0.12	Hudsonian Godwit	0.0034
Solitary Sandpiper	0.08	Peregrine Falcon	0.0025
Olive-sided Flycatcher	0.04	Golden Eagle	0.0008
Arctic Tern	0.03		

Source: Harwood 2000 and 2002.

3.12.5.1.5 CLIMATE CHANGE

Climate change is affecting resources in the EIS Analysis area and trends associated with climate change are projected to continue into the future. Section 3.26.2 discusses climate change trends and impacts to key resources in the physical and biological environments including atmosphere, water resources, permafrost, and vegetation. Current and future effects on birds are tied to changes in physical resources and vegetation (discussed in Section 3.26.3).

3.12.5.2 ENVIRONMENTAL CONSEQUENCES

Table 3.12-32 describes the criteria used to rank the impact level for each type of effect the project may have on birds. These criteria were used to determine the summary impact level for each project component and alternative.

Table 3.12-32: Impact Criteria for Effects on Birds

Type of Effect	Impact Component	Effects Summary		
Behavioral Disturbance	Magnitude or Intensity	Low: Changes in behavior due to project activity may not be noticeable; animals remain in the vicinity.	Medium: Noticeable change in behavior due to project activity that may affect reproduction or survival of individuals.	High: Acute or obvious/abrupt change in behavior due to project activity; life functions are disrupted; animal populations are reduced in the EIS Analysis Area.
	Duration	Temporary: Behavior patterns altered infrequently, but not longer than construction phase and would be expected to return to pre-activity levels after actions causing impacts were to cease.	Long-term: Behavior patterns altered for several years and would return to pre-activity levels long-term (from the end of construction through the life of the mine, and up to 100 years) after actions causing impacts were to cease.	Permanent: Change in behavior patterns would continue even if actions that caused the impacts were to cease; behavior not expected to return to previous patterns.
	Geographic Extent	Local: Impacts limited geographically; limited to vicinity of the Project Area or a subset.	Regional: Affects resources beyond a local area, potentially throughout the EIS Analysis Area.	Extended: Affects resources beyond the region or EIS Analysis Area.
	Context	Common: Affects usual or ordinary species in the EIS Analysis Area; species is not depleted in the locality, used by subsistence hunters, listed under the ESA, or considered a Species of Concern.	Important: Affects depleted species within the locality or region, used by subsistence hunters, or considered a Species of Concern	Unique: Affects species protected under the ESA.
Habitat Alterations	Magnitude or Intensity	Low: Changes in resource character or quantity may not be measurable or noticeable.	Medium: Noticeable changes in resource character and quantity.	High: Acute or obvious changes in resource character and quantity.
	Duration	Temporary: Resource would be reduced infrequently but not longer than the span of 1 year and would be expected to return soon to pre-activity levels.	Long-term: Resource would be reduced for up to the life of the project and would return to pre-activity levels in the long-term.	Permanent: Resource would not be anticipated to return to previous character or levels.
	Geographic Extent	Local: Impacts limited geographically; limited to vicinity of the Project Area.	Regional: Affects resources beyond a local area, potentially throughout the EIS Analysis Area.	Extended: Affects resources beyond the region or EIS Analysis Area.

Table 3.12-32: Impact Criteria for Effects on Birds

Type of Effect	Impact Component	Effects Summary		
Habitat Alterations (continued)	Context	Common: Affects usual or ordinary habitat in the EIS Analysis Area; habitat is not depleted in the locality or protected by legislation.	Important: Affects depleted habitat within the locality or region or habitat protected by legislation.	Unique: Affects habitat protected by legislation, such as designated critical habitat.
Injury and Mortality	Magnitude or Intensity	Low: No noticeable incidents of injury or mortality; population level effects not detectable.	Medium: Incidents of injury or mortality are detectable; populations remain within normal variation.	High: Incidents of mortality or injury create population-level effects.
	Duration	Temporary: Events with potential for mortality or injury would occur for a brief, discrete period lasting less than one year, or up to the duration of the construction phase.	Long-term: Events with potential for mortality or injury would continue for up to the life of the project.	Permanent: Potential for mortality or injury would persist after actions that caused the disturbance ceased.
	Geographic Extent	Local: Impacts would be limited to vicinity of the Project Area or subsets.	Regional: Impact would occur beyond a local area, potentially throughout the EIS Analysis Area.	Extended: Impacts would occur beyond the region or EIS Analysis Area.
	Context	Common: Affects usual or ordinary species in the EIS Analysis Area; species is not depleted in the locality, used by subsistence hunters, listed under the ESA, or considered a Species of Concern.	Important: Affects depleted species within the locality or region, used by subsistence hunters, or considered a Species of Concern	Unique: Affects species protected under the ESA.

3.12.5.2.1 ALTERNATIVE 1 – NO ACTION

Under the No Action alternative the Donlin Gold Project would not be constructed. Minor impacts to birds would continue from ongoing mineral exploration and from reclamation of existing exploration and related disturbance (camp, roads, and airstrip), which may affect birds.

3.12.5.2.2 ALTERNATIVE 2 – DONLIN GOLD'S PROPOSED ACTION

Potential Impacts

The following is a general description of the impact sources to all bird species. Details such as acres of habitat or specific nests affected are described in later discussions of components and phases.

Habitat Loss/Alteration

Long-term habitat loss would occur as the existing vegetation is removed and replaced with buildings, roads, runways, and other mine components. For some components the amount of habitat temporarily disturbed during the construction phase and then revegetated would be larger than the long-term footprint of the facilities. The loss of habitat would directly impact bird species whose home ranges fall within disturbance area as well as (to a lesser extent) those migrating through the area. This habitat loss would affect species that are currently using the area, whether for nesting, foraging, or migrating. As described in Section 3.10, Vegetation, and shown on Figures 3.10-3, 3.10-4, and 3.10-5A-G, the two most dominant vegetation types in the mine site and transportation facilities areas are coniferous forest and mixed deciduous forest. Potential nest trees, such as black and white spruce and cottonwood, are abundant in this habitat. Another indication that there are plenty of nest trees for raptors is the number of unoccupied nests observed during the raptor surveys; an average of 73 per year were observed during the 6 years of surveys at the mine site, and 22 per year observed during the 3 years of surveys along the pipeline. Based on this information it is unlikely that nest trees are a limiting factor for raptor populations in the EIS Analysis Area. Because of this, the loss of a few nests would not cause a high impact on more than a local basis because of the larger home ranges of these species. The magnitude of the impact loss would be high only on a local basis (moderate overall), however, because the habitat types affected are common in the EIS Analysis Area. Loss of habitat used during migration could affect bird populations beyond the Project Area as migrants would be forced to use other areas to rest and forage. The effect would be much smaller than the effect on breeding, because migrants use the habitat briefly and don't have to depend on it to feed their young.

Indirect impacts of habitat loss could occur if birds avoid areas beyond the Project Area but adjacent to the new facilities. Avian response to habitat fragmentation is species-specific. Some species avoid edge habitat for reasons such as microclimate or increased predation. Some avian species prefer early successional habitats; and habitat availability for these species may increase as a result of fragmentation. Avian species that avoid edge habitat would lose more habitat than just that contained in the Project Area where new edges are created because they would lose the area cleared plus the adjacent habitat that is too close to the new edge. Habitat not directly lost due to construction may still become less suitable for some birds for other reasons. Changes in vegetation communities could result if invasive species were introduced; groundwater pumping and dewatering of streams and wetlands in the vicinity of the mine may alter bird habitat; and increased human presence may cause birds to leave otherwise suitable habitat. Even reclamation is likely to replace existing habitats with habitats that would be altered for the long-term (from the end of construction through the life of the mine, and up to 100 years).

In order to estimate the number of birds potentially affected by habitat loss or alteration, the species- and habitat-specific density estimates described in 3.12.5.1, Affected Environment, were multiplied by the amount of habitat that would be lost or altered under each alternative. These estimates of the number of pairs affected are a maximum number that describe the effects during the first breeding season. The estimates are not to be construed as a number of pairs "lost" annually to be multiplied by the duration of operations. Displaced birds are not lost to the population; that could only occur if the adjacent areas were at maximum carrying capacity such that there was not enough available habitat to support them. There is no evidence to suggest that this is the case in the Project Area. It is expected that most birds affected by the habitat loss, even those known to have high nest site fidelity, would likely move to similar

habitat in the surrounding area. While the habitat loss would be long-term to permanent, the disturbance of nesting birds would likely be much shorter-term as displaced individuals disperse. The overall impact of habitat loss and alteration under any of the action alternatives would be moderate because, although the intensity of impacts is locally high, potentially large numbers of birds may be affected, and the duration of impacts would be long-term, the extent of the impacts is local, and most of the species affected are common (although a few are considered important). The effects of nest site loss are described below under the heading Nest Site Loss or Disturbance.

Blasting/Noise

Blasting would occur daily at the mine site and as needed at several material sites. Noise would increase above current levels throughout much of the EIS Analysis Area during the construction and operations phases of: the mine; the support infrastructure; the port; and along the roads and the pipeline, especially at above-ground facilities and during inspections. While impacts to birds during the construction phase would be short-term, operations of the mine and transportation facilities would increase noise levels long-term.

Loud noises from short-term events such as blasting are known to startle nearby birds and may cause them to leave the area and can even lead to nest abandonment. The tug- and barge-related noise on the Kuskokwim River would be transient. Aircraft, vehicle, and heavy equipment noise would occur at the mine site. There would be no noise emissions along the pipeline during operations with the exception of low levels of noise emitted from the compressor station and periodic aircraft inspection overflights. During the post-closure period, water would be pumped from the pit lake for treatment and discharge to Crooked Creek. Noise from the pumps, power plant, and other facilities would likely be accommodated and would have minor impacts.

Bird use of otherwise suitable habitat may be reduced due to sensitivity to noise. The degree of disturbance varies among individuals, species, and time of year. Francis et al 2009 concluded that noise changes the composition of avian communities in favor of more noise-tolerant species, thus reducing nesting species richness, although not necessarily density. The study suggests that predatory birds might avoid noise because it masks their calls or makes it harder to locate prey, thus making nests in noisier areas safer from predators. Some birds may habituate to noise from steady-state sources, such as equipment and the pipeline compressor station, and such noise alone generally does not result in major changes in normal wildlife activities. In areas with regular but non-threatening noise, birds may habituate and exhibit little discernible response. As a complement to other project-related human activities, however, such noise may contribute to bird avoidance of the proposed Project Area. Because mining-related activities have occurred in and around the mine site area for several decades, birds may already be habituated to human-related disturbances. Birds would likely disperse from the local area during construction activities, especially during activities that generate loud noise. Migrants may avoid the project vicinity during noisy periods rather than stopping over during migration.

Noise impacts on bald or golden eagle nests would be analyzed for compliance with the Bald and Golden Eagle Act following the pre-construction raptor survey. If eagle nests are identified in the vicinity of the mine site or material sites where blasting may occur, an Eagle Act Permit may be required.

Attraction to Tailings Ponds or Other Water Bodies with Potentially Toxic Contaminants

The proposed project would create new areas of standing water including the CWD Ponds, freshwater storage impoundments, the surface of the tailings pond during operations, and the pit lake during closure. These new areas of standing water will attract birds

Birds may be affected by direct contact by drinking the water, or by eating contaminated plants or invertebrates that may be present. ERA details for the pit lake, TSF and CWD ponds are discussed in Section 3.12.2.1.

The estimated water concentrations of antimony, arsenic, and selenium are expected to be higher in the TSF than in the pit lake. The TSF, which would be an active component of the mine during its operations, would not be an attractive or exclusive source of water for birds and mammals. Mining activities would result in fluctuating water levels, changing metals concentrations, and active deposition of tailings. Also, there would be little opportunity for growth of vegetation or invertebrates along the margins of the TSF because it would be a lined facility and water levels would fluctuate. During the operations phase, tailings would be added continuously and water would be pumped out of the TSF for reuse

As discussed in Section 3.12.2.1, birds are not likely to remain long due in open water areas despite earlier thaw or later freezing due to the lack of food resources. Water is also a major attractant to birds for bathing purposes. Post-bath preening could cause ingestion of water and contaminants present on the feathers. Landbirds aren't expected to bathe in most of the open water areas because they have been designed to be too deep for them to stand in. The primary exposure for birds would be from drinking or bathing in the water during any brief stopovers during migration.

Considering representative exposure assumptions, the lack of attractive habitat features, and chronic intense disturbance from mining equipment, birds are not expected to be at risk from ingestion of potentially toxic water from the TSF or from ingestion of potentially toxic food and sediment.

Based on the calculations and discussion of exposure in the ERA, no birds would be expected to be at risk from ingestion of water during the filling stage of the pit lake or from ingestion of surface water, sediment, or food from the mature pit lake.

The water quality of the Lower CWD Pond is expected to be highly variable because of varying inputs and withdrawals. At the upper end of the range, toxic constituents would be at higher concentrations than in the TSF. For the Lower CWD Pond, much like the TSF, the lack of attractive food sources or other habitat features, chronic intense disturbance from mining equipment, and the availability of other nearby water sources would minimize the risk of bird exposure to water from the Lower CWD Pond. In consideration of representative exposure assumptions (e.g., 10 percent exposure factor), birds would not be expected to be at risk from ingestion of water, food, or sediment from the Lower CWD Pond.

The Upper CWD Pond is expected to have less variable and better water quality than the Lower CWD Pond because its primary source of water is natural runoff from undisturbed land and it will only receive water from the Lower CWD Pond under certain conditions. Given the expected short-term exposure, birds are not expected to be at risk from toxic arsenic or other metals in the water. However, the surrounding habitat is more attractive than adjacent to the Lower CWD Pond, so exposure could be long enough for a few individual birds to be at risk.

Direct Injury/Mortality from Collisions

The proposed project would include erecting power lines, communication towers, guy wires, and numerous structures. These features, along with the mine-associated vehicles, aircraft, and vessels, pose a risk of collision for birds. Because the proposed Project Area lies within a well-documented migration corridor for many waterfowl and shorebird species, the concern is potentially high. If migrating birds are killed or injured, the effects would extend to populations beyond the Project Area. Many waterfowl species, especially geese and swans, form long-term monogamous bonds, which could result in population declines if many pairs lose mates.

Collisions with power lines and electrocutions cause many bird deaths annually in the United States. All the planned above-ground power lines would pose a collision threat primarily to raptors, waterfowl, and ptarmigan but could cause deaths among smaller species. The degree of threat would be related to the size and design of the structures, the line (wire) profile, and the geographic location of the power line with respect to key habitats and flight pathways. Donlin is expected to design the overhead power lines in accordance with standard industry best practices for avian protection and relevant State and Federal guidelines, which would reduce the potential for adverse impacts (See Chapter 5, Impact Avoidance, Minimization, and Mitigation).

Vehicle collision mortality of wildlife is well documented. The width and length of a roadway, the speed of vehicles, the surrounding terrain and habitat, and the density of traffic are all variables that can influence mortality along roadways. Studies have produced different results, making it difficult to draw conclusions about avian mortality in particular (Erritzoe et al. 2003). Vehicle collision mortality would be minimized along project roads through enforcement of low speed limits. Mortality rates for avian species may be expected to decline over time due to a postulated 'learning effect,' whereby birds acclimate to the presence of the road and develop behaviors to avoid collisions (e.g., flying higher when crossing the road to avoid vehicles) (Havlin 1987). Legagneux and Ducatez (2013) found that birds changed their flight initiation distances in response to vehicles according to road speed limit (a known factor affecting killing rates on roads) rather than car speed, suggesting that birds are able to associate road sections with speed limits as a way to assess collision risk.

Hundreds of millions of birds die each year in collisions with manmade structures, including glass windows and buildings, communication towers, and wind turbines (American Bird Conservancy 2013). Lighting, atmospheric conditions, and the number and size of windows appear to be contributing factors to avian collision mortality. Due to the scale of industrial activity in the facilities associated with the mine, power plant, and mill, most avian species would likely avoid the area around the mine infrastructure, thus reducing structure collision mortality. However, the camp facilities would be located away from the mine infrastructure, creating a potential for avian mortality from collisions with structures and towers. Some species may be attracted to the facility lights, especially during times of poor visibility such as during bad weather conditions. Down-shielded lights would be used to reduce the potential for collisions.

Bird collisions with aircraft have been well documented. The FAA (2013) published a report presenting a summary analysis of data from the National Wildlife Strike Database for 1990 through 2012. The number of strikes annually reported has increased almost 6-fold from 1,851 in 1990 to a record 10,726 in 2012. A total of 127,202 birds of 482 species were reported as struck by aircraft. Factors that contribute to this increasing threat are increasing populations of large

birds near some airports, increased air traffic, and increased use of quieter aircraft, such as turbofan-powered. Waterfowl, gulls, and raptors were the groups with the most numerous and most damaging strikes. Species with high numbers of strikes in Alaska as reported in the FAA Wildlife Strike Database for Alaska (FAA 2013) that could also occur in the Project Area include bald eagle, Canada goose, American golden-plover, bank swallow, and ducks.

Project-related aircraft operation would be highest during the construction phase, with an expected 1,187 helicopter flights per year for the pipeline and 3 fixed-wing aircraft flights/day/spread. A spread is a pipeline construction section; the pipeline would be divided into two spreads for construction purposes. During the operations phase the number of flights would decrease for both the pipeline and mine site, but would remain above current levels. The increased amount of air traffic would pose a collision risk to all bird species, as well as a safety hazard to the pilots and passengers. The degree of risk would be related to the location and timing of the flights with respect to key habitats and flight pathways.

While individual birds could be injured or killed from collisions with power lines or other structures or vehicles such as trucks, aircraft, or vessels, the number affected is expected to be small because the interaction opportunities are relatively small compared with places where large numbers have been reported (such as busy airports and urbanized areas), and because most birds would be able to avoid the project-related hazards. Casualties are not expected to cause population-level impacts.

Nest Site Loss or Disturbance

Nest sites may be lost either directly through habitat loss due to construction, or indirectly through disturbance or degradation to adjacent habitat. Mickelson (1975) found that human activity near Canada geese brood rearing areas adversely affected the broods. When brood counts were made, parents would often outdistance and desert their young, leaving them susceptible to the ever-present glaucous gulls. When brood members became separated after being startled by humans or approaching boats, some young may have been lost. The sound of a boat would send Canada goose families fleeing. Disturbances at the time of onset of nesting caused some reduction in nesting density. While vegetation clearing for construction would be conducted outside the bird nesting period to avoid take of migratory birds, loss of traditionally-used nest sites could still occur. For example, if a tree or shrub used annually for nesting by an owl were removed outside the nesting season it would not be available to that bird the next spring. The owl may be able to find another suitable tree in the adjacent suitable habitat that remains, or it may be so disturbed by the loss and the construction activity that it may not nest that season. Adjacent habitat may also become unsuitable for nesting due to the increased noise and human presence, or changes in vegetation types, predator abundance, or hydrology. Some species, such as swallows, sparrows, semipalmated plovers, and spotted sandpipers may be attracted to the altered habitat. Cliff swallows have established nesting colonies on structures at the exploration camp, under the bridge over American Creek, and on machinery near Crooked Creek. Bank swallows, semipalmated plovers, and spotted sandpipers have colonized excavated areas near Crooked Creek. Savannah sparrows are found in open areas adjacent to the current runway (Placer Dome Technical Services Limited 2005). Overall, the project would reduce the amount and suitability of nesting habitat for most bird species.

Vegetation would be cleared during FWS' recommended time period outside the nesting season in order to minimize impacts to migratory birds. The number and species of birds using the

areas that would be affected by the proposed Donlin Gold Project could change markedly. Some species would likely be displaced from the affected habitat, while other species may move into the altered habitat.

The number of nests lost or disturbed would be highest during the construction phase and would diminish as birds become accustomed to the new activities and learn to avoid them. Closure phase reclamation activities would include re-contouring and reseeding disturbed areas with native seeds. While the area is expected to re-vegetate, it may not have the same vegetation composition, habitat, or avian species as it did prior to disturbance.

Due to the abundance of coniferous and deciduous forest habitat in the EIS Analysis Area, it is unlikely that nesting habitat, including large trees, is a limiting factor in bird populations in the proposed Project Area. Therefore, the loss of nests and nesting habitat in the immediate project vicinity, while it may affect local populations, is not likely to impact birds outside the affected area. Any loss of eagle nest trees would have to be permitted through FWS' Eagle Permit Program.

Increased Barge Traffic

The increased amount of barge traffic on the Kuskokwim River from near Crooked Creek downstream to marine waters could affect birds through visual or noise disturbance, alteration of habitat through bank erosion or habitat use by barge wakes, risk of collisions, and risk of fuel or other hazardous materials spills that could be toxic or severely degrade important bird habitat. The effects of fuel or other spills on birds are discussed in Section 3.24, Spill Risk.

The barges would travel through the Yukon Delta National Wildlife Refuge which was created to protect and maintain internationally significant waterfowl, shorebird, marine mammal, and salmonid populations, subsistence use, and other resources. As described in Section 3.12.5.1, Affected Environment, the Kuskokwim River provides habitat for 30 Species of Concern, many of which breed there in exceptionally high densities, making the habitat along the barge route of regional importance to these species' populations. The Bering Sea and the Gulf of Alaska have numerous foraging areas of regional or global importance for sea ducks, seabirds, breeding seabird colonies, as well as important migratory stopover areas for shorebirds.

The project would put these areas at higher risk of disturbance and habitat degradation from erosion or contaminant spills. Although nesting takes place primarily above the waterline, birds near the barge route would be subject to both visual and noise disturbance from increased barge traffic.

The noise and movement of the barges may disturb birds foraging or nesting along the shores. The noise generated by the barge would be audible to shore-based receptors for a maximum estimated time of 1.04 hours per occurrence (ARCADIS 2013a). Lights from barges may attract birds causing them to collide with the barge. The prop wash from these barges can re-suspend bottom sediments in shallow waters, which could affect aquatic invertebrates and other potential food organisms, but the affected areas in the river are not used for feeding by large numbers of birds.

Birds that forage in the waters of the Kuskokwim River, such as gulls, terns, and ducks may be more directly affected by the increased number and size of barges. Agness (2006) identifies the following three classes of impacts from disturbance by vessels (especially fast-moving ones— which the barges are not).

1. A direct impact on offspring survival when vessels travel in proximity to swimming duck broods. Broods respond by scattering, increasing vulnerability to predation encounters (Keller 1991), and resulting in higher incidence of offspring mortality (Mikola et al. 1994).
2. A reduction in foraging behavior and an increase in energetically costly behavior, such as flight. Behavior changes can constitute energetic impact at high rates of vessel traffic (Korschgen et al. 1985).
3. A loss of suitable habitat, as vessel traffic can reduce bird use of vessel disturbed areas (Kaiser and Fritzell 1984; Bamford et al. 1990; Berry 1988).

While some studies have documented a variety of behavioral responses to vessel-related disturbance, including increased alert behavior, flight, swimming, and a reduction in foraging (Agness 2006), others have shown that habituation of birds to disturbance is possible. For example, in an area with a high rate of human visitation, some individual wading birds responded more strongly to passing vehicles than did others, suggesting that some were habituated to disturbance (Stolen 2003). Waterbird responses to vessel traffic may be dependent on species, biological cycle (e.g., breeding, migrating, stopover, wintering), and/or vessel attributes (e.g., vessel type, size, and speed). There is also a distance component. When vessels are very close to the occupied habitat, the response is likely to be greater, especially if the vessel approaches rapidly. The greater the distance from the habitat, the lower the response and the easier would be habituation.

Waterbirds in the Kuskokwim River may be habituated to vessel traffic, and an additional one or two tug and barge passages per day may not have a notable impact. Most of the barge route will have the barges passing at great enough distance from shoreline bird habitat that any behavioral responses are expected to be small. Foraging habitat within the river would be affected more. Foraging waterbirds would have to expend more energy to avoid collisions and may avoid the portions of the river with the highest traffic levels – thereby losing foraging habitat. This effect is also expected to be relatively small.

Bank erosion, already occurring in several areas along the river, may be accelerated by the increased number of barges (see Section 3.11, Wetlands, for estimates). Erosion could affect species nesting close to the riverbanks (see Table 3.12-33), as well as those foraging in this habitat due to potential impacts on prey species. Erosion could also affect fish species birds prey on. Fish habitat provided by streamside vegetation, overhanging banks, and appropriately sized substrate can be altered or destroyed by accelerated rates of bank erosion (Dorava and Moore 1997).

The effects of fuel or other spills on birds are discussed in Section 3.24, Spill Risk.

Table 3.12-33: Species Observed in the Project Area Known to Nest Along Shorelines

Black Scoter	Spotted Sandpiper	Northern Waterthrush
Northern Pintail	Arctic Tern	Long-tailed Duck
Red-breasted Merganser	Red-necked Grebe	Canada Goose
Harlequin Duck	Pacific Loon	Greater White-fronted Goose
Mallard	Green-winged Teal	Tundra Swan
Semi-palmated plover	Red-necked Phalarope	Red Phalarope
Mew Gull	Sabine's Gull	Greater Scaup
Solitary Sandpiper	Spotted Sandpiper	Lesser Yellowlegs
Black Turnstone	Greater Yellowlegs	Black-bellied Plover

Source: ARCADIS 2013a and Bowman 2008.

Attraction to Organic Waste

Birds would be attracted to any organic wastes available to them in the proposed Project Area. If organic wastes are not made to be inaccessible, populations of scavenging birds such as gulls, ravens, bald eagles, jays, and magpies would increase, which could lead to increased nest predation on other bird species. Although all wastes would be managed to avoid attracting scavengers (as required by regulations), no management program achieves 100 percent control, therefore minor impacts on birds are expected as a result of the production of organic waste.

Subsistence Birds and Species of Concern

The project could affect the 29 bird species listed as Species of Concern that were observed in the EIS Analysis Area, as well as birds used by subsistence hunters, through any of the impact sources discussed above.

The context of impacts relate to the status of the species affected. While none of the bird species addressed in this section are listed under the ESA, 29 species are considered Species of Concern, and some of these have substantial portions of their global populations nesting or migrating within or relatively near the EIS Analysis Area. This reliance on the area puts them at greater risk, therefore the context of any potential impacts on these species (listed in Table 3.12-34) is considered important. Also considered important are Species of Concern that breed in high densities in the EIS Analysis Area compared to other parts of their breeding range, and several species that are highly sensitive to disturbance while nesting.

Birds used by subsistence hunters are also considered important due to their value as a food source. These bird groups are listed in Table 3.12-34.

Table 3.12-34: Impact Context for Selected Bird Species

Context	Reason	Species
Important	Species used by subsistence hunters	Upland gamebirds Ducks Geese Swans Cranes Other migratory waterfowl
Important	Species of Concern	red-throated loon yellow-billed loon American golden plover arctic tern bald eagle golden eagle gyrfalcon peregrine falcon short-eared owl gray-cheeked thrush varied thrush
Important	Species of Concern with regionally to globally substantial portions of their populations occurring in the region.	bristle-thighed curlew Hudsonian godwit bar-tailed godwit dunlin black turnstone red knot western sandpiper rock sandpiper
Important	Species of Concern that breed at high densities in the proposed Project Area compared to other parts of their breeding range.	whimbrel olive-sided flycatcher solitary sandpiper lesser yellowlegs short-billed dowitcher blackpoll warbler rusty blackbird
Important	Breeding birds very sensitive to disturbance.	tundra swan trumpeter swan

Source: Species of Concern are based on evaluations by the Alaska Department of Fish and Game (2006), Alaska Shorebird Group (2008), Audubon Alaska (Kirchhoff and Padula 2010), AKNHP (2015d), Boreal Partners in Flight (in prep.), or the FWS (2008).

Climate Change Summary for Alternative 2

Predicted overall increases in temperatures and precipitation and changes in the patterns of their distribution (McGuire 2015, Chapin et al. 2010, Chapin et al. 2006, Walsh et al. 2005) have the potential to influence the projected effects of the Donlin Gold Project on vegetation, wetlands, and associated bird habitat. An overall warming/drying trend would tend to convert some wetlands to uplands and tend to increase the cover of shrubs and trees in previously open areas. Warming conditions may lead to increases in infectious disease in wildlife, or conditions that favor the release of persistent environmental pollutants that can affect the immune system and favor an increased disease rate (Bradley et al. 2005). See Section 3.26 (Climate Change) for further details on climate change and resources.

Direct and Indirect Effects

Mine Site – Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

Birds at the mine site could be affected by habitat loss (6,347 acres of coniferous forest, 848 acres of deciduous/mixed forest, 389 acres of herbaceous, 1,273 acres of shrub, and 173 acres of other land cover); noise; potential environmental contamination from the tailings pond; and collisions with vehicles, equipment, or structures.

The magnitude of the impact of habitat loss would be moderate because there is an abundance of similar habitat in surrounding areas, as demonstrated by a comparison to vegetation within the watershed shown in Table 3.10-10, Vegetation. The duration would be temporary for construction areas and long-term to permanent for the Project Area. After mine closure the area would be reclaimed including recontouring roadways and reseeding disturbed areas with native seeds as described in the Reclamation and Closure Plan. These areas are expected to revegetate; however, they may not have the same vegetation composition, habitat, or avian species as they did prior to disturbance. Some disturbed areas such as the monitoring access and the pit lake itself would not be revegetated; therefore, some habitat loss would be permanent. The geographic extent would be local, and the context common to important, as some species in Table 3.12-35 were observed at the mine site.

Table 3.12-35 below presents the estimated number of breeding bird pairs potentially affected by habitat loss or alteration at the mine site and transportation facilities. These numbers were calculated by multiplying the estimated densities (Section 3.12.5.1, Affected Environment) by the amount of each habitat loss. The shaded cells indicate Species of Concern. The effects of nest site loss are described earlier in this section under the heading Nest Site Loss or Disturbance.

This table includes only those species for which density information was calculated from the mine site breeding bird survey data, and does not include all bird species or groups potentially affected. It does reflect the relative observed abundance of each species, which are generally comparable to abundances of birds found in other studies of comparable habitats and general locations.

Table 3.12-35: Estimated Number of Breeding Bird Pairs Potentially Affected by Habitat Loss or Alteration at the Mine Site and Transportation Facilities under Alternative 2

Habitat	Species	Estimated Density using EDR (birds/acre)	Habitat Lost or Altered (acres)	Estimated Number of Bird Pairs Affected
Forested-Deciduous/Mixed	Fox sparrow	0.12	981.73	118
	Common redpoll	0.26	981.73	255
	Swainson's thrush	0.12	981.73	118
	White-crowned sparrow	0.04	981.73	39
	Ruby-crowned kinglet	0.24	981.73	235
	American robin	0.04	981.73	39
	Gray-cheeked thrush	0.03	981.73	29
	Yellow-rumped warbler	0.20	981.73	197
	Dark-eyed junco	0.06	981.73	58

Table 3.12-35: Estimated Number of Breeding Bird Pairs Potentially Affected by Habitat Loss or Alteration at the Mine Site and Transportation Facilities under Alternative 2

Habitat	Species	Estimated Density using EDR (birds/acre)	Habitat Lost or Altered (acres)	Estimated Number of Bird Pairs Affected
	Varied thrush	0.01	981.73	10
	Gray jay	0.05	981.73	49
	Wilson's warbler	0.02	981.73	20
	Olive-sided flycatcher	0.01	981.73	10
	Alder flycatcher	0.02	981.73	20
	White-winged crossbill	0.01	981.73	10
	Orange-crowned warbler	0.01	981.73	10
	American pipit	0.003	981.73	3
	Blackpoll warbler	0.07	981.73	69
Herbaceous	Fox sparrow	0.03	199.91	6
	Common redpoll	0.26	199.91	52
	Swainson's thrush	0.02	199.91	4
	White-crowned sparrow	0.05	199.91	10
	Ruby-crowned kinglet	0.01	199.91	2
	American robin	0.03	199.91	6
	Gray-cheeked thrush	0.01	199.91	2
	Yellow-rumped warbler	0.01	199.91	2
	Dark-eyed junco	0.02	199.91	4
	Varied thrush	0.02	199.91	4
	Gray jay	0.01	199.91	2
	Wilson's warbler	0.01	199.91	2
	Olive-sided flycatcher	0.01	199.91	2
	Alder flycatcher	0.004	199.91	<1
	White-winged crossbill	0.003	199.91	<1
	Orange-crowned warbler	0.01	199.91	2
	American pipit	0.0014	199.91	<1
	Blackpoll warbler	0.01	199.91	2
Needleleaf Forest	Fox sparrow	0.08	6,724.60	538
	Common redpoll	0.30	6,724.60	2,017
	Swainson's thrush	0.07	6,724.60	471
	White-crowned sparrow	0.06	6,724.60	403
	Ruby-crowned kinglet	0.08	6,724.60	538
	American robin	0.04	6,724.60	269
	Gray-cheeked thrush	0.05	6,724.60	336
	Yellow-rumped warbler	0.08	6,724.60	538
	Dark-eyed junco	0.06	6,724.60	403
	Varied thrush	0.003	6,724.60	20
	Gray jay	0.08	6,724.60	538
	Wilson's warbler	0.01	6,724.60	67
	Olive-sided flycatcher	0.005	6,724.60	34
	Alder flycatcher	0.02	6,724.60	134

Table 3.12-35: Estimated Number of Breeding Bird Pairs Potentially Affected by Habitat Loss or Alteration at the Mine Site and Transportation Facilities under Alternative 2

Habitat	Species	Estimated Density using EDR (birds/acre)	Habitat Lost or Altered (acres)	Estimated Number of Bird Pairs Affected
Needleleaf Forest (continued)	White-winged crossbill	0.05	6,724.60	336
	Orange-crowned warbler	0.003	6,724.60	20
	American pipit	0.0002	6,724.60	1
	Blackpoll warbler	0.02	6,724.60	134
Shrub	Fox sparrow	0.01	1,821.01	18
	Common redpoll	0.42	1,821.01	765
	Swainson's thrush	0.03	1,821.01	55
	White-crowned sparrow	0.09	1,821.01	164
	Ruby-crowned kinglet	0.02	1,821.01	36
	American robin	0.05	1,821.01	91
	Gray-cheeked thrush	0.08	1,821.01	146
	Yellow-rumped warbler	0.04	1,821.01	73
	Dark-eyed junco	0.07	1,821.01	127
	Varied thrush	0.02	1,821.01	36
	Gray jay	0.03	1,821.01	55
	Wilson's warbler	0.03	1,821.01	55
	Olive-sided flycatcher	0.002	1,821.01	5
	Alder flycatcher	0.01	1,821.01	18
	White-winged crossbill	0.00	1,821.01	<1
	Orange-crowned warbler	0.02	1,821.01	36
	American pipit	0.01	1,821.01	18
	Blackpoll warbler	0.003	1,821.01	5
Total:				10,010

Source: Calculations made based on data from ARCADIS 2010b.

Raptor nest surveys documented 13 raptor species nesting in the vicinity of the proposed mine site. These nests would be surveyed by a qualified biologist during the spring breeding season prior to start of construction. If nests cannot be avoided during nesting season the FWS would be contacted to assist in determining how to reduce impacts. It is expected that if construction occurs in suitable habitat before the onset of the breeding season, the construction disturbance would cause the raptors to seek alternate nest sites. Raptors returning to nest sites that have been removed during the non-breeding season may fail to nest that season, but are likely to move to adjacent similar habitat fairly quickly. Eagles and their nests are protected under the Bald and Golden Eagle Protection Act; any impacts to these species may require consultation with the FWS and an Eagle Act Permit.

The magnitude of impact of environmental contamination from birds coming into contact with the tailings ponds, CWD Ponds, and pit lake is low because the exposure is expected to be low. The duration would be long-term or permanent because the tailings pond and CWD Ponds would be there through the operations phase of the mine, and the pit lake would be present from the closure phase onward. The extent would be local. Even though species that migrate beyond the region might be attracted to the water features, they would not stay long enough to

have exposure of consequence. The context is common to important because some of the species that may be attracted to the open water are Species of Concern or birds used by subsistence hunters, included in Table 3.12-30.

Mercury contamination is another issue of concern, since the background levels in the region are above some regulatory levels. The mining operation will mobilize mercury in dust and in other airborne forms (even with stringent control measures), and the levels in soil will increase slightly (0.1 to 6 percent with one method of calculation, and about 11 to 22 percent with another method over 35 years – see Section 3.2.3.2.4, Soils). The change in methylmercury is the indicator of higher interest for biological systems, because that is the form that can bioaccumulate and biomagnify, making top-of-food chain organisms at greatest risk. The Crooked Creek drainage is the area with greatest predicted mercury increases, and the levels of mercury measured in fish tissue there are well below the EPA criterion for human fish consumption (see Section 3.7.2.1.1, Water Quality). While the mercury methylation process is complex, factors that would increase it, such as increases in wetland area or depletion of oxygen in waters, or increases in populations of large resident fish, are not likely to increase with mining operations. Therefore, it is unlikely that top-of-food chain organisms like bald eagles would be adversely affected by increases in mercury from mine operations.

Blasting/noise impacts would be medium intensity, long-term duration (life of project), would be limited to local extent at the mine site and material sites, and would affect common to important species. Noise effects from the water treatment facility and its power generator would be minor and localized, but would continue for as long as the water treatment facility operates (projected to be in perpetuity).

Collision impacts would be medium intensity as incidents of injury or mortality are not expected to be numerous enough to create population-level effects. The risk would be long-term (life of project) and local, but could affect common to important species.

The impact of organic waste causing an increase in predators would be low intensity, long-term duration, local extent, and would affect common to important species. Management procedures would be expected to substantially reduce these impacts.

Conclusion – Mine Site

The effects of the mine site under Alternative 2 range from low (organic waste) to moderate (habitat loss) magnitude. Some impacts would be temporary (during the construction phase only) while others would occur long-term (life of project), and some could persist after mining ceases (habitat loss and environmental contamination). The extent of impacts such as habitat loss would be local (limited to Project Area and immediate areas). Both common and important species could be affected. The overall direct and indirect effects of the mine site on birds would be moderate.

Transportation Facilities – Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

Birds in the transportation facilities area could be affected by habitat loss (411 acres of coniferous forest, 148 acres of deciduous/mixed forest, 5 acres of herbaceous, 304 acres of shrub, and 4 acres of other land cover) along the 30-mile long road and port site, noise, risk of environmental contamination from fuel spills, and collisions with vehicles or equipment.

The magnitude of the impact of habitat loss would be moderate because there is an abundance of similar habitat in surrounding areas. The predominant habitat types within this area are shrub communities and needleleaf forests followed by less dominant types including broadleaf and mixed forests. Avian species in impacted areas would be displaced to nearby similar habitat. The duration would be temporary for construction areas and permanent for the road and port site footprints. After mine closure the area would be reclaimed including recontouring roadways and reseeding disturbed areas with native seeds. These areas are expected to revegetate; however, they would not have the same plant composition, habitat, or avian species as they did prior to disturbance. Therefore, habitat loss would be permanent. The geographic extent would be local (footprint plus construction area), and the context common to important. A total of 8 raptor nests were found within 1 mile of the proposed Jungjuk road route and port site.

Blasting would occur at material sites during the construction phase. Noise impacts from trucks and equipment would be medium intensity, long-term duration (life of project), limited to local extent at the facilities, and would affect primarily common to important species.

Collision impacts would be low to medium intensity as incidents of injury or mortality are not expected to be numerous enough to create population-level effects. The risk would be long-term (life of project) and local, but could affect primarily common to important species.

The impact of organic waste potentially causing an increase in predators would be low intensity, long-term duration, local extent, and could affect common or important species.

The barge traffic would mainly impact waterbirds using the Kuskokwim River. Construction and operations of the proposed project would require the transport of fuel and supplies by barge on the Kuskokwim River during the barge season (Table 3.12-36). Transporting fuel and supplies to the project site would require approximately 122 tug and barge trips per season to the Angyaruaq (Jungjuk) Port (in addition to background barge traffic of about half that amount). One or two tug and barge combinations would be moving on the river each day of the summer barge season. The effects of barge traffic on waterbird species may range from low to moderate.

Table 3.12-36: Estimated Annual Ocean and River Barge Traffic Under Alternative 2

Barge	Transporting	From	To	Number of Round Trips per season
Ocean	Cargo	Marine Terminals	Bethel	16 during construction 12 during operations
Ocean	Fuel	Marine Terminals	Dutch Harbor	7
Ocean	Fuel	Dutch Harbor	Bethel	14
River	Cargo	Bethel	Angyaruaq (Jungjuk) Port Site	64
River	Fuel	Bethel	Angyaruaq (Jungjuk) Port Site	58

The magnitude of impact of increased barge traffic disturbing shoreline nesting birds is medium because it could cause a noticeable change in behavior and may affect reproduction. The duration would be long-term because the barges would run for the life of the mine. The extent could be extended because impacts could affect species that migrate beyond the region. The context is common to important because some of the species potentially affected are Species of Concern or birds used by subsistence hunters, included in Table 3.12-30.

Conclusion – Transportation Facilities

The magnitude of the effects of the transportation facilities area under Alternative 2 ranges from low to moderate. Some impacts would be temporary (during the construction phase only) while others would occur long-term, and some could persist after mining ceases. The extent of impacts such as habitat loss would be local (limited to Project Area) while regional or extended impacts are possible if migratory birds are affected. Both common and important species could be affected. The overall direct and indirect effects of the transportation facilities area on birds would be moderate.

Natural Gas Pipeline – Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

Birds along the 315-mile long pipeline could be affected by habitat loss (2,232 acres of deciduous/mixed forest, 290 acres of herbaceous, 3,393 acres of shrub, and 145 acres of other land cover), noise, increased risk of major pipeline rupture that could cause a fire or explosion, collisions with vehicles or equipment, or electrocution from the 15-mile long overhead power line. Donlin Gold has not conducted point-count surveys along the proposed pipeline route as have been conducted in the vicinity of the proposed mine site. The only avian surveys conducted in the pipeline corridor were the aerial raptor nesting surveys (ARCADIS 2012e). Therefore landbird density estimates were obtained from a published report of a survey in the project vicinity (Hinkes and Engels 1989) and applied to the mapped habitats along the pipeline corridor.

Table 3.12-37 shows the estimated number of pairs of landbirds for which density information is available that may be affected by the habitat loss. Species of Concern are noted by shaded cells. This table includes only those species for which density information was available and as such does not include all bird species or groups potentially affected.

Table 3.12-37: Estimated Number of Breeding Bird Pairs Potentially Affected by Habitat Loss or Alteration at the Pipeline under Alternative 2

Habitat	Species	Estimated Density using EDR (birds/acre)	Habitat Lost or Altered (acres)	Estimated Number of Bird Pairs Affected
Forested-Deciduous/Mixed	Fox sparrow	0.24	2,231.56	536
	Redpoll sp.	0.12	2,231.56	268
	Swainson's thrush	0.53	2,231.56	1,183
	White-crowned sparrow	0.00	2,231.56	0
	Ruby-crowned kinglet	0.24	2,231.56	536
	American robin	0.06	2,231.56	134
	Gray-cheeked thrush	0.03	2,231.56	67
	Yellow-rumped warbler	0.30	2,231.56	669

Table 3.12-37: Estimated Number of Breeding Bird Pairs Potentially Affected by Habitat Loss or Alteration at the Pipeline under Alternative 2

Habitat	Species	Estimated Density using EDR (birds/acre)	Habitat Lost or Altered (acres)	Estimated Number of Bird Pairs Affected
Forested-Deciduous/Mixed (continued)	Dark-eyed junco	0.30	2,231.56	669
	Varied thrush	0.06	2,231.56	134
	Gray jay	0.18	2,231.56	402
	Olive-sided flycatcher	0.18	2,231.56	402
	Alder flycatcher	0.35	2,231.56	781
	White-winged crossbill	0.00	2,231.56	0
	Orange-crowned warbler	0.00	2,231.56	0
	Blackpoll warbler	0.24	2,231.56	536
Needleleaf Forest	Fox sparrow	0.00	2069.674	0
	Redpoll sp.	0.03	2069.674	62
	Swainson's thrush	0.18	2069.674	373
	White-crowned sparrow	0.05	2069.674	103
	Ruby-crowned kinglet	0.21	2069.674	435
	American robin	0.03	2069.674	62
	Gray-cheeked thrush	0.15	2069.674	310
	Yellow-rumped warbler	0.30	2069.674	621
	Dark-eyed junco	0.17	2069.674	352
	Varied thrush	0.13	2069.674	269
	Gray jay	0.15	2069.674	310
	Olive-sided flycatcher	0.00	2069.674	0
	Alder flycatcher	0.00	2069.674	0
	White-winged crossbill	0.03	2069.674	62
	Orange-crowned warbler	0.00	2069.674	0
	Blackpoll warbler	0.00	2069.674	0
Shrub	Fox sparrow	0.00	3393.527	0
	Redpoll sp.	0.18	3393.527	611
	Swainson's thrush	0.08	3393.527	271
	White-crowned sparrow	0.40	3393.527	1,357
	Ruby-crowned kinglet	0.00	3393.527	0
	American robin	0.03	3393.527	102
	Gray-cheeked thrush	0.09	3393.527	305
	Yellow-rumped warbler	0.00	3393.527	0
	Dark-eyed junco	0.32	3393.527	1,086
	Varied thrush	0.00	3393.527	0
	Gray jay	0.00	3393.527	0
	Olive-sided flycatcher	0.00	3393.527	0
	Alder flycatcher	0.00	3393.527	0
	White-winged crossbill	0.00	3393.527	0
	Orange-crowned warbler	0.16	3393.527	543
	Blackpoll warbler	0.00	3393.527	0
			Total:	13,551

The magnitude of the impact of habitat loss would be moderate because there is an abundance of similar habitat in surrounding areas (estimated in Section 3.10, Vegetation). Direct loss of avian habitat would occur within the footprint of the pipeline; 6 new airstrips, 56 temporary gravel access roads, and 8 temporary worker camps. During the construction and operations phases of the proposed natural gas pipeline, impacts to some avian species can be expected from habitat fragmentation, with impacts most pronounced during construction when the corridor is fully cleared to install the pipeline. Impacts would lessen over time as the corridor would be revegetated, thus minimizing the edge effect and habitat fragmentation-related effects. The habitat surrounding the pipeline, but not necessarily within the cleared ROW, is considered suitable for any species displaced. The duration would be temporary for construction areas and the buried facilities, but long-term for the above-ground facilities and the gravel pads. After mine closure the pipeline would be abandoned in place and all above-ground facilities removed, except gravel pads, which would be left in place. Cleared land would be contoured to restore appropriate grades and revegetated. The geographic extent would be local (disturbance footprint plus construction area), and both common and important species could be affected.

Blasting may be necessary at material sites at Pass Creek and Kusko West. Blasting and construction noise may cause individuals to be displaced from suitable habitat. However, habitat types in the areas surrounding the pipeline are similar and likely suitable for relocation. There would be no noise emissions along the pipeline during operations with the exception of low levels of noise emitted from the compressor station and inspection overflights. Noise impacts could be high intensity/ short duration (blasting), or low intensity, long-term duration (life of the project). During operations the effects would be limited to local extent at the facilities and could affect both common and important species.

Collisions could occur with vehicles or equipment during the construction or operations phases or with the overhead power lines during operations.

If the power lines are constructed without adequate protections, raptors interacting with the 15-mile long power line could be electrocuted. Raptors are attracted to power lines, especially in areas without other tall perches. They use power poles and towers as perches from which to establish territorial boundaries, hunt, rest, find shade, feed, and sun themselves. Power line structures are also used by many species as nesting substrates. Literature accounts of raptor power line interactions since 1981 indicate that raptor electrocution remains a widespread problem in North America and throughout the world. Raptors vary widely in their susceptibility to electrocution. Those most at risk include larger species such as red-tailed hawk and eagles. Golden eagles are particularly vulnerable to electrocution because of their large size (wingspans up to 7.5 feet). Many eagle electrocutions are caused by simultaneous skin-to-skin, foot-to-skin, and beak-to-skin contacts with two phase wires or a phase and a ground (APLIC 1996). Both bald and golden eagle nests were found along the proposed pipeline. Figure 3.12-10 shows numerous bald eagle nests and a red-tailed hawk nest in the vicinity of the proposed power line. The power line would put these individuals and their offspring at risk of injury or mortality. Young birds would be especially at risk because they are less adept at flying and landing on power poles.

Mitigation measures necessary to reduce the level of impact from the risk of electrocution at the power lines are possible. In 2006 the Avian Power Line Interaction Committee published "Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006." This

document describes how proper spacing of design elements can substantially reduce the risk of electrocution. The key objective for raptor protection is to provide a 60-inch minimum separation between conductors and/or grounded hardware, or to insulate hardware or conductors against simultaneous contact if such separation is not possible. Following the guidelines for safer power lines would substantially reduce the risk of electrocution. Donlin has committed to designing the overhead power lines in accordance with standard industry best practices for avian protection and relevant State and Federal guidelines.

Collision impacts would be medium intensity as incidents of injury or mortality are not expected to be numerous enough to create even local population-level effects. The risk would be long-term (life of project) and local, and could affect common to important species.

Raptor nest surveys documented five raptor species classified as state or federal species of conservation concern nesting in the vicinity of the proposed pipeline. These nests would be surveyed by a qualified biologist during the spring breeding season prior to start of construction. It is expected that, if construction occurs in suitable habitat before the onset of the breeding season, the construction disturbance would cause the raptors to seek alternate nest sites.

Swans (either tundra or trumpeter, identification was uncertain) were observed nesting in the vicinity of the proposed pipeline, mainly close to the eastern end near the Susitna River. Trumpeter swans have also been documented nesting near the Kuskokwim River crossing. If these nest sites are abandoned, it is expected that displaced individuals would move to adjacent suitable habitat where they might have to compete with other swans. Other waterbirds nesting in the wetlands affected by the pipeline construction and operations could also be displaced.

The impact of a major pipeline rupture could be high intensity, with temporary to permanent impacts if it causes a fire, local to regional extent (if a large area is burned), and could affect common to important species. Since most of the pipeline is buried, the potential for a fire is very low.

Conclusion – Natural Gas Pipeline

The magnitude of effects of the proposed pipeline under Alternative 2 range from low to moderate, and the duration of impacts ranges from temporary to permanent. The extent of impacts would be local (limited to Project Area), or regional (e.g., if large areas are burned). The context would be common to important. The overall effect of the pipeline on birds would be moderate.

Summary Conclusion – Alternative 2

Table 3.12-38 presents the impact levels of Alternative 2 by impact type and project component. Moderate impacts could only occur from the project as planned (without accidental release of contaminants) at the mine site. The proposed transportation facilities and pipeline could cause minor to moderate impacts. Standard design features are expected to reduce impacts at all three components to the levels defined. The mitigation measures described could substantially reduce impacts by designing the overhead power line to be raptor-safe.

Table 3.12-38: Impact Levels of Alternative 2 by Impact Type and Project Component

Impacts	Impact Level				
	Magnitude or Intensity	Duration	Geographic Extent	Context	Summary Impact Rating ¹
Mine Site					
Habitat loss or alteration	Medium	Temporary, Long-term, or permanent	Local	Common to important	Moderate
Environmental contamination from tailings pond, CWD Ponds, and pit lake	Low	Permanent	Local	Common to Important	Minor
Blasting/noise	Medium	Long-term Intermittent	Local	Common	Moderate
Risk of injury or mortality from collisions	Low	Long-term	Local	Common to Important	Minor
Predators attracted to organic waste	Low	Long-term	Local	Common	Minor
Transportation Facilities					
Habitat loss	Medium	Temporary and Long-term	Local	Common to Important	Moderate
Increased barge traffic	Low to Medium	Long-term	Local to Regional	Common to Important	Minor to Moderate
Risk of injury or mortality from collisions	Low to Medium	Long-term	Local	Common to Important	Minor
Blasting/Noise	Medium to High	Temporary	Local	Common to Important	Minor
Predators attracted to organic waste	Low	Long-term	Local	Common to important	Minor
Pipeline					
Habitat loss	Medium	Temporary and Long-term	Local	Common to Important	Moderate
Blasting/noise	Low to Medium	Temporary	Local	Common to Important	Minor
Risk of injury or mortality from collisions	Low to Medium	Long-term	Local	Common to Important	Minor

Notes:

- 1 The summary impact rating accounts for impact reducing design features proposed by Donlin Gold and Standard Permit Conditions and BMPs that would be required. It does not account for additional mitigation measures the Corps is considering.

The effects of Alternative 2 on birds would be low to medium intensity, with some changes such as habitat loss being prominent. Some effects, such as disturbance from increased barge traffic, would be intermittent and some temporary (during the construction phase only), while the duration of other impacts could extend for the life of the project or beyond, such as habitat changes at the mine site. The geographical extent of impacts would generally be within the

Project Area, but could become expanded or extensive if migrating birds were affected, as those impacts could affect bird populations outside the proposed Project Area. The context of impacts is common to important, but not unique, as impacts to threatened or endangered birds are discussed in Section 3.14, Threatened and Endangered Species. The overall direct and indirect effects of Alternative 2 on birds would be moderate.

These effects determinations take into account impact reducing design features (Table 5.2-1 in Chapter 5, Impact Avoidance, Minimization, and Mitigation) proposed by Donlin Gold and also the Standard Permit Conditions and BMPs (Section 5.3, Chapter 5, Impact Avoidance, Minimization, and Mitigation) that would be implemented. Several examples of these are presented below.

Design features most important for reducing impacts to birds include:

- Raptor nest surveys would be conducted during the spring prior to start of construction. If occupied nests are found close to areas of proposed activity, the activity would be scheduled to occur outside the nesting season if feasible. If not feasible, the FWS would be consulted to assist in determining measures necessary to avoid impacts to nesting raptors.
- Where practicable, fully shielded light fixtures would be used to reduce potential light attraction to migratory birds.
- The project design includes routing of the pipeline and siting of the related compressor station along an existing corridor in Susitna Flats State Game Refuge to minimize impacts.

Standard Permit Conditions and BMPs most important for reducing impacts to birds include:

- Preparation of a Wildlife Avoidance and Human Encounter/Interaction Plan, and
- Implementation of Stormwater Pollution Prevention Plans (SWPPPs) and/or Erosion and Sediment Control Plans.

Additional Mitigation and Monitoring for Alternative 2

The Corps is considering additional mitigation (Table 5.5-1 in Chapter 5, Impact Avoidance, Minimization, and Mitigation) to reduce the effects presented above. These additional mitigation measures include:

- Reduce the risk of electrocution of raptors from above-ground power lines by following nationally recognized design guidelines for avian protection. An example of a national recognized guideline is the "Suggested Practices of Avian Protection on Power Lines: The State of the Art in 2006" (APLIC 2012).
- Specific plans for borrow site reclamation would be completed in a later phase of the project. In addition to standard BMPs for contouring, drainage, and erosion controls (Section 3.2, Soils), reclamation should consider creating ponds and/or stream connections for fish and wildlife habitat at borrow sites in low lying areas (e.g., at Getmuna Creek) in accordance with ADEC and ADF&G guidance (Shannon & Wilson 2012; McClean 1993).

As mentioned above, if these mitigation measures were adopted and required, impacts could be reduced for the mine site, but impacts would remain moderate. For the, transportation facilities and natural gas pipeline, the impacts would be somewhat reduced but would remain moderate. No additional monitoring measures are being considered by the Corps at this time to reduce the impacts to birds.

3.12.5.2.3 ALTERNATIVE 3A – REDUCED DIESEL BARGING: LNG-POWERED HAUL TRUCKS

Mine Site – Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

There would be no change in the location or operations of the mine site under Alternative 3A; therefore, the impacts to birds from the mine site would be the same as described under Alternative 2.

Transportation Facilities – Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

Alternative 3A differs from Alternative 2 in that it would involve 65 percent fewer ocean fuel barge trips and 67 percent fewer river fuel barge trips because of the decreased use of diesel fuel (see Table 3.12-39). There would also be 67 percent fewer truck trips hauling diesel on the Angyaruaq (Jungjuk) Port road.

Table 3.12-39: Estimated Annual Ocean and River Barge Traffic Under Alternative 3A

Barge	Transporting	From	To	Number of Round Trips per Season
Ocean	Cargo	Marine Terminals	Bethel	16 during construction 12 during operations
Ocean	Fuel	Marine Terminals	Dutch Harbor	2
Ocean	Fuel	Dutch Harbor	Bethel	4 during construction 5 during operations
River	Cargo	Bethel	Angyaruaq (Jungjuk) Port Site	64
River	Fuel	Bethel	Angyaruaq (Jungjuk) Port Site	19

Reducing the number of fuel barge trips reduces, but does not eliminate, the potential for adverse impacts to birds. The chance of barges affecting birds through behavioral disturbance or risk of injury or mortality from collision with vessels would be reduced to minor. Therefore, the potential direct and indirect effects of the Transportation Facilities under Alternative 3 on birds would be minor.

Natural Gas Pipeline – Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

There would be no change in the location or operations of the pipeline under Alternative 3A, therefore the impacts to birds from the pipeline would be the same as described under Alternative 2.

Summary Conclusion for Alternative 3A

Moderate impacts could occur from the project as planned at the mine site. All impacts associated with the proposed transportation facilities and pipeline would be minor to moderate. Standard design features are expected to reduce impacts at all three components to the levels previously defined. Impacts associated with climate change would also be the same as those discussed for Alternative 2. The overall potential direct and indirect effects of Alternative 3A on birds would be the same as described under Alternative 2. These effects determinations take into account applicable impact reducing design features and BMPs, as discussed in Alternative 2. If the mitigation measures discussed under Alternative 2 were to be implemented, the impacts would be similar to Alternative 2, and would remain minor to moderate.

3.12.5.2.4 ALTERNATIVE 3B – REDUCED DIESEL BARGING: DIESEL PIPELINE

Under Alternative 3B, an 18-inch diameter diesel pipeline would be constructed from Cook Inlet to the mine site to eliminate diesel barging on the Kuskokwim River. The diesel pipeline would replace the natural gas pipeline. The diesel pipeline would be located in the same corridor proposed for the natural gas pipeline under Alternative 2, with an additional segment between Tyonek and the start of the proposed corridor for the natural gas line. The diesel pipeline would extend 334 miles from Cook Inlet to the Donlin Mine. The diesel pipeline would require a 19-mile extension from the proposed terminus of the natural gas pipeline, south to Tyonek. This additional segment would cross the Beluga River.

This alternative would require either construction of a new dock facility in Tyonek or expansion of the existing Tyonek North Foreland Barge Facility. A new tanker berth system would be needed at Tyonek to accommodate the tide, ice, and seismic conditions and provide adequate depth for continuous 24-hour operation. A barge landing at Tyonek sufficient for most tidal stages would be required to support the construction and operations of the facilities. Tanks sufficient for storing one month's fuel consumption, approximately 10-million gallons, would be installed at each end of the pipeline.

Mine Site – Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

There would be no change in the location of the mine site under Alternative 3B; however, there would be a change in the operations. Diesel fuel would be used instead of natural gas. The difference in fuel is not expected to change the type or level of effects on birds at the mine site. Therefore, the impacts to birds from the mine site would be the same as described under Alternative 2.

Transportation Facilities – Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

The transportation facilities would remain the same as Alternative 2; however diesel barging would be eliminated on the Kuskokwim River after the construction phase. Both river and ocean cargo barges would still be necessary for cargo, but total barge traffic would be substantially reduced. The reduction in fuel barge traffic on the Kuskokwim River would reduce the level of all barge-related impacts to birds in those areas to minor. However, the addition of a diesel fuel barge from either of the Northwest marine terminals or Nikiski to Tyonek and expansion of the facilities at Tyonek could cause the same types of barge-related impacts to birds in Cook Inlet.

Diesel Pipeline – Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

The location of the proposed pipeline would remain the same as Alternative 2; however, rather than natural gas the pipeline would carry diesel fuel. The diesel pipeline would require a 19-mile extension from the proposed terminus of the natural gas pipeline, south to Tyonek. The additional segment would cross the Beluga River and adjacent wetlands. In addition, this alternative would require extension of the existing Tyonek North Foreland Barge Facility to reach greater depth. The habitat loss for this additional segment would include 18 acres of coniferous forest, 12 acres of deciduous/mixed forest, 6 acres of herbaceous, 49 acres of shrub, 13 acres of other land cover, and 151 acres of unknown habitat. Table 3.12-40 shows the estimated number of breeding bird pairs that may be affected by the total amount of habitat loss or alteration for the pipeline. This table does not include birds affected by the impacts on the 151 acres of unknown habitat. Species of Concern are indicated by shaded rows. These impacts are in addition to those for the natural gas pipeline. The effects of nest site loss are described in Section 3.12.5.2.2 under the heading Nest Site Loss or Disturbance.

Table 3.12-40: Estimated Number of Breeding Bird Pairs Potentially Affected by Habitat Loss or Alteration at the Pipeline under Alternative 3B

Habitat	Species	Estimated Density using EDR (birds/acre)	Habitat Lost or Altered (acres)	Estimated Number of Bird Pairs Affected
Forested-Deciduous/Mixed	Fox sparrow	0.24	2,257.36	542
	Redpoll sp.	0.12	2,257.36	271
	Swainson's thrush	0.53	2,257.36	1,196
	White-crowned sparrow	0.00	2,257.36	0
	Ruby-crowned kinglet	0.24	2,257.36	542
	American robin	0.06	2,257.36	135
	Gray-cheeked thrush	0.03	2,257.36	68
	Yellow-rumped warbler	0.30	2,257.36	677
	Dark-eyed junco	0.30	2,257.36	677
	Varied thrush	0.06	2,257.36	135
	Gray jay	0.18	2,257.36	406
	Olive-sided flycatcher	0.18	2,257.36	406
	Alder flycatcher	0.35	2,257.36	790

Table 3.12-40: Estimated Number of Breeding Bird Pairs Potentially Affected by Habitat Loss or Alteration at the Pipeline under Alternative 3B

Habitat	Species	Estimated Density using EDR (birds/acre)	Habitat Lost or Altered (acres)	Estimated Number of Bird Pairs Affected
Forested-Deciduous/Mixed (continued)	White-winged crossbill	0.00	2,257.36	0
	Orange-crowned warbler	0.00	2,257.36	0
	Blackpoll warbler	0.24	2,257.36	542
Needleleaf Forest	Fox sparrow	0.00	2,088.74	0
	Redpoll sp.	0.03	2,088.74	63
	Swainson's thrush	0.18	2,088.74	376
	White-crowned sparrow	0.05	2,088.74	104
	Ruby-crowned kinglet	0.21	2,088.74	439
	American robin	0.03	2,088.74	63
	Gray-cheeked thrush	0.15	2,088.74	313
	Yellow-rumped warbler	0.30	2,088.74	627
	Dark-eyed junco	0.17	2,088.74	355
	Varied thrush	0.13	2,088.74	272
	Gray jay	0.15	2,088.74	313
	Olive-sided flycatcher	0.00	2,088.74	0
	Alder flycatcher	0.00	2,088.74	0
	White-winged crossbill	0.03	2,088.74	63
	Orange-crowned warbler	0.00	2,088.74	0
	Blackpoll warbler	0.00	2,088.74	0
Shrub	Fox sparrow	0.00	3,468.97	0
	Redpoll sp.	0.18	3,468.97	624
	Swainson's thrush	0.08	3,468.97	278
	White-crowned sparrow	0.40	3,468.97	1,388
	Ruby-crowned kinglet	0.00	3,468.97	0
	American robin	0.03	3,468.97	104
	Gray-cheeked thrush	0.09	3,468.97	312
	Yellow-rumped warbler	0.00	3,468.97	0
	Dark-eyed junco	0.32	3,468.97	1,110
	Varied thrush	0.00	3,468.97	0
	Gray jay	0.00	3,468.97	0
	Olive-sided flycatcher	0.00	3,468.97	0
	Alder flycatcher	0.00	3,468.97	0
	White-winged crossbill	0.00	3,468.97	0
	Orange-crowned warbler	0.16	3,468.97	555
	Blackpoll warbler	0.00	3,468.97	0
			Total:	13,746

Source: Calculations based on data in ARCADIS 2011b.

Spill response requirements and pre-positioned equipment storage would require leaving some construction facilities, roads, helipads, and airstrips in a usable condition after pipeline construction. While this alternative includes additional habitat loss and increased risk of habitat

degradation, the impact level remains moderate because the habitat loss is relatively small compared to the amount in the region, and habitat is not a limiting factor for birds in the area.

Summary Conclusion – Alternative 3B

Moderate impacts could occur from the project as planned at the mine site. Impacts from the proposed transportation facilities and pipeline would be minor to moderate. Standard design features are expected to reduce impacts of all three components to the level predicted above. Impacts associated with climate change would also be the same as those discussed for Alternative 2. Therefore, the overall potential direct and indirect effects of Alternative 3B on birds would be about the same as described under Alternative 2. These effects determinations take into account applicable impact reducing design features and BMPs, as discussed in Alternative 2. If the mitigation measures discussed under Alternative 2 were to be implemented, the impacts would be similar to Alternative 2, and would remain minor to moderate.

3.12.5.2.5 ALTERNATIVE 4 – BIRCH TREE CROSSING PORT

Under Alternative 4 the upriver port site would be located at BTC, approximately 60 miles downstream from the Angyaruaq (Jungjuk) Port site proposed under Alternative 2. This would reduce the barge distance for freight and diesel out of Bethel bound for the mine site. A new 76-mile access road between the BTC Port and the mine site would be constructed for transporting fuel and cargo for the project. This is about 2.5 times the length of the road to the Angyaruaq (Jungjuk) Port site. As proposed under Alternative 2, the road would be a two-lane, 30-foot wide, all-season gravel road used for mine support traffic. The road would cross 40 streams, 5 of which are anadromous. Eight of the stream crossings would require bridges and 32 would require culverts. There would be no other substantive changes from Alternative 2.

Mine Site – Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

There would be no change in the location or operations of the mine site under Alternative 4; therefore, the potential impact to birds from the mine site would be the same as described under Alternative 2.

Transportation Facilities – Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

Alternative 4 would build a port at BTC with the same infrastructure that is proposed for Alternative 2. While there are fewer river miles between Bethel and BTC, this would be offset by a longer road to the mine site (76 miles compared to 30 for Alternative 2). Because the haul distance would be longer, additional cargo and fuel tanker trucks would be procured for transporting these materials to the mine site. However, the shorter barge distance shortens the round trip time and fewer barge miles would be required. Overall, Alternative 4 would have the same number of barge trips as are proposed for Alternative 2.

The change in the location of the river port would eliminate project-related barge traffic on approximately 60 miles of the Kuskokwim River between the BTC port site and the Angyaruaq

(Jungjuk) Port site. This would eliminate any barge-related effects on birds in that stretch of the river.

The longer port road would cause additional habitat loss (718 acres of coniferous forest, 120 acres of deciduous/mixed forest, 130 acres of herbaceous, 806 acres of shrub, and 15 acres of other land cover) and increase the risk of bird/vehicles collisions (because there would be about 2.5 times as many truck miles and trucking hours). A total of 16 raptor nests were found within 1 mile of the BTC road route and port site and along the proposed winter ice road that would be used during the construction phase (2 Harlan's hawks, 3 red-tailed hawks, 1 osprey, 1 bald eagle, 3 common ravens, 1 great gray owl, 1 golden eagle, 1 great horned owl, 2 peregrine falcons, and 1 unidentified raptor) (compared to 14 along the Jungjuk road/port site proposed under Alternative 2). Overall, the changes to the transportation facilities would change the location and type of potential impacts, but the level of impact would remain the same as Alternative 2 – moderate. Table 3.12-41 presents the estimated number of breeding bird pairs that may be affected by habitat loss or alteration at the mine site and transportation areas combined. Species of Concern are indicated by shaded rows. The effects of nest site loss are described in Section 3.12.5.2.2 under the heading Nest Site Loss or Disturbance.

Table 3.12-41: Estimated Number of Breeding Bird Pairs Potentially Affected by Habitat Loss or Alteration at the Mine Site and Transportation Facilities under Alternative 4

Habitat	Species	Estimated Density using EDR (birds/acre)	Habitat Lost or Altered (acres)	Estimated Number of Bird Pairs Affected
Forested- Deciduous/Mixed	Fox sparrow	0.12	974.04	117
	Common redpoll	0.26	974.04	253
	Swainson's thrush	0.12	974.04	117
	White-crowned sparrow	0.04	974.04	39
	Ruby-crowned kinglet	0.24	974.04	234
	American robin	0.04	974.04	39
	Gray-cheeked thrush	0.03	974.04	29
	Yellow-rumped warbler	0.20	974.04	194
	Dark-eyed junco	0.06	974.04	59
	Varied thrush	0.01	974.04	10
	Gray jay	0.05	974.04	49
	Wilson's warbler	0.02	974.04	20
	Olive-sided flycatcher	0.01	974.04	10
	Alder flycatcher	0.02	974.04	20
	White-winged crossbill	0.01	974.04	10
	Orange-crowned warbler	0.01	974.04	10
	American pipit	0.003	974.04	3
	Blackpoll warbler	0.07	974.04	68
Herbaceous	Fox sparrow	0.03	347.15	10
	Common redpoll	0.26	347.15	90
	Swainson's thrush	0.02	347.15	7
	White-crowned sparrow	0.05	347.15	17
	Ruby-crowned kinglet	0.01	347.15	3
	American robin	0.03	347.15	10

Table 3.12-41: Estimated Number of Breeding Bird Pairs Potentially Affected by Habitat Loss or Alteration at the Mine Site and Transportation Facilities under Alternative 4

Habitat	Species	Estimated Density using EDR (birds/acre)	Habitat Lost or Altered (acres)	Estimated Number of Bird Pairs Affected
Herbaceous (continued)	Gray-cheeked thrush	0.01	347.15	3
	Yellow-rumped warbler	0.01	347.15	3
	Dark-eyed junco	0.02	347.15	7
	Varied thrush	0.02	347.15	7
	Gray jay	0.01	347.15	3
	Wilson's warbler	0.01	347.15	3
	Olive-sided flycatcher	0.01	347.15	3
	Alder flycatcher	0.004	347.15	1
	White-winged crossbill	0.003	347.15	1
	Orange-crowned warbler	0.01	347.15	3
	American pipit	0.001	347.15	<1
	Blackpoll warbler	0.01	347.15	3
Needleleaf Forest	Fox sparrow	0.08	7,005.20	560
	Common redpoll	0.30	7,005.20	2,101
	Swainson's thrush	0.07	7,005.20	490
	White-crowned sparrow	0.06	7,005.20	520
	Ruby-crowned kinglet	0.08	7,005.20	560
	American robin	0.04	7,005.20	280
	Gray-cheeked thrush	0.05	7,005.20	350
	Yellow-rumped warbler	0.08	7,005.20	560
	Dark-eyed junco	0.06	7,005.20	520
	Varied thrush	0.003	7,005.20	21
	Gray jay	0.08	7,005.20	560
	Wilson's warbler	0.01	7,005.20	70
	Olive-sided flycatcher	0.005	7,005.20	350
	Alder flycatcher	0.02	7,005.20	140
	White-winged crossbill	0.05	7,005.20	350
	Orange-crowned warbler	0.003	7,005.20	21
	American pipit	0.0002	7,005.20	1
	Blackpoll warbler	0.02	7,005.20	140
Shrub	Fox sparrow	0.01	2,310.83	23
	Common redpoll	0.42	2,310.83	970
	Swainson's thrush	0.03	2,310.83	70
	White-crowned sparrow	0.09	2,310.83	208
	Ruby-crowned kinglet	0.02	2,310.83	46
	American robin	0.05	2,310.83	115
	Gray-cheeked thrush	0.08	2,310.83	185
	Yellow-rumped warbler	0.04	2,310.83	92
	Dark-eyed junco	0.07	2,310.83	162
	Varied thrush	0.02	2,310.83	46
	Gray jay	0.03	2,310.83	70

Table 3.12-41: Estimated Number of Breeding Bird Pairs Potentially Affected by Habitat Loss or Alteration at the Mine Site and Transportation Facilities under Alternative 4

Habitat	Species	Estimated Density using EDR (birds/acre)	Habitat Lost or Altered (acres)	Estimated Number of Bird Pairs Affected
Shrub (continued)	Wilson's warbler	0.03	2,310.83	70
	Olive-sided flycatcher	0.002	2,310.83	4.6
	Alder flycatcher	0.01	2,310.83	23
	White-winged crossbill	0.00	2,310.83	0
	Orange-crowned warbler	0.02	2,310.83	46
	American pipit	0.01	2,310.83	23
	Blackpoll warbler	0.003	2,310.83	7
Total:				10,852

Source: Calculations based on data in ARCADIS 2011b.

Natural Gas Pipeline – Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

There would be no change in the location or operations of the pipeline under Alternative 4; therefore, the potential impact to birds from the proposed pipeline would be the same as described under Alternative 2.

Summary Conclusion – Alternative 4

Moderate impacts could occur from the project as planned at the mine site. At the proposed transportation facilities and pipeline all impacts would be minor to moderate. Standard design features are expected to reduce impacts of all three components. The overall potential direct and indirect effects of Alternative 4 on birds would be the same as described under Alternative 2. These effects determinations take into account applicable impact reducing design features and BMPs, as discussed in Alternative 2. If the mitigation measures discussed under Alternative 2 were to be implemented, the impacts would be similar to Alternative 2, and would remain minor to moderate.

3.12.5.2.6 ALTERNATIVE 5A – DRY STACK TAILINGS

Alternatives 5A would involve an alternate tailings disposal method. This alternative differs from Alternative 2 only at the mine site. The other two project components (transportation facilities and pipeline) would remain the same as described under Alternative 2 and would cause the same (moderate) level of impact to birds. Therefore, only the impacts at the mine site are described below. The primary objective of the “dry stack” process is to reduce the potential of tailings water leaving the tailings storage facility and thus to reduce potential impact to the environment.

Mine Site – Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

Under Alternative 5A the footprint of the mine site would be reduced by 165.3 acres compared to Alternative 2. This change would decrease the amount of bird habitat affected. Table 3.12-42 shows the estimated number of bird pairs affected. The shaded cells indicate Species of Concern. The effects of nest site loss are described in Section 3.12.5.2.2 under the heading Nest Site Loss or Disturbance.

Table 3.12-42: Estimated Number of Breeding Bird Pairs Potentially Affected by Habitat Loss or Alteration at the Mine Site and Transportation Facilities under Alternative 5A

Habitat	Species	Estimated Density using EDR (birds/acre)	Habitat Lost or Altered (acres)	Estimated Number of Bird Pairs Affected
Forested-Deciduous/Mixed	Fox sparrow	0.12	996.85	125
	Common redpoll	0.26	996.85	267
	Swainson's thrush	0.12	996.85	116
	White-crowned sparrow	0.04	996.85	36
	Ruby-crowned kinglet	0.24	996.85	235
	American robin	0.04	996.85	42
	Gray-cheeked thrush	0.03	996.85	35
	Yellow-rumped warbler	0.20	996.85	200
	Dark-eyed junco	0.06	996.85	64
	Varied thrush	0.01	996.85	13
	Gray jay	0.05	996.85	45
	Wilson's warbler	0.02	996.85	22
	Olive-sided flycatcher	0.01	996.85	7
	Alder flycatcher	0.02	996.85	27
	White-winged crossbill	0.01	996.85	5
	Orange-crowned warbler	0.01	996.85	10
	American pipit	0.0003	996.85	2
	Blackpoll warbler	0.07	996.85	66
Herbaceous	Fox sparrow	0.03	200.17	6
	Common redpoll	0.26	200.17	52
	Swainson's thrush	0.02	200.17	4
	White-crowned sparrow	0.05	200.17	9
	Ruby-crowned kinglet	0.01	200.17	3
	American robin	0.03	200.17	7
	Gray-cheeked thrush	0.01	200.17	3
	Yellow-rumped warbler	0.01	200.17	2
	Dark-eyed junco	0.02	200.17	5
	Varied thrush	0.02	200.17	4
	Gray jay	0.01	200.17	1
	Wilson's warbler	0.01	200.17	2
	Olive-sided flycatcher	0.01	200.17	1
	Alder flycatcher	0.004	200.17	<1
	White-winged crossbill	0.002	200.17	<1
	Orange-crowned warbler	0.01	200.17	2

Table 3.12-42: Estimated Number of Breeding Bird Pairs Potentially Affected by Habitat Loss or Alteration at the Mine Site and Transportation Facilities under Alternative 5A

Habitat	Species	Estimated Density using EDR (birds/acre)	Habitat Lost or Altered (acres)	Estimated Number of Bird Pairs Affected
	American pipit	0.0014	200.17	6
	Blackpoll warbler	0.01	200.17	<1
Needleleaf Forest	Fox sparrow	0.08	6,544.31	541
	Common redpoll	0.30	6,544.31	1,961
	Swainson's thrush	0.07	6,544.31	481
	White-crowned sparrow	0.06	6,544.31	375
	Ruby-crowned kinglet	0.08	6,544.31	524
	American robin	0.04	6,544.31	251
	Gray-cheeked thrush	0.05	6,544.31	321
	Yellow-rumped warbler	0.08	6,544.31	554
	Dark-eyed junco	0.06	6,544.31	417
	Varied thrush	0.003	6,544.31	18
	Gray jay	0.08	6,544.31	501
	Wilson's warbler	0.01	6,544.31	37
	Olive-sided flycatcher	0.005	6,544.31	31
	Alder flycatcher	0.02	6,544.31	102
	White-winged crossbill	0.05	6,544.31	304
	Orange-crowned warbler	0.003	6,544.31	19
	American pipit	0.0002	6,544.31	1
	Blackpoll warbler	0.02	6,544.31	160
Shrub	Fox sparrow	0.01	1,820.65	131
	Common redpoll	0.42	1,820.65	765
	Swainson's thrush	0.03	1,820.65	58
	White-crowned sparrow	0.09	1,820.65	170
	Ruby-crowned kinglet	0.02	1,820.65	38
	American robin	0.05	1,820.65	83
	Gray-cheeked thrush	0.08	1,820.65	153
	Yellow-rumped warbler	0.04	1,820.65	66
	Dark-eyed junco	0.07	1,820.65	125
	Varied thrush	0.02	1,820.65	40
	Gray jay	0.03	1,820.65	59
	Wilson's warbler	0.03	1,820.65	62
	Olive-sided flycatcher	0.002	1,820.65	4
	Alder flycatcher	0.01	1,820.65	11
	White-winged crossbill	0.00	1,820.65	0
	Orange-crowned warbler	0.02	1,820.65	34
	American pipit	0.01	1,820.65	25
	Blackpoll warbler	0.003	1,820.65	6
Total:				9,848

Source: Calculations based on data in ARCADIS 2011b.

The amount of open water at the mine site would be reduced by roughly half compared to Alternative 2. This reduction in open water would reduce the already low risk of birds being attracted to the mine site and being adversely affected by ingesting contaminated water.

Summary Conclusion – Alternative 5A

The change in tailing disposal method would directly affect birds by reducing the amount of habitat loss or alteration at the mine site by 165.3 acres, and by reducing the size of the open water areas that could attract and potentially contaminate birds. Impacts associated with climate change would also be the same as those discussed for Alternative 2. The effects of the transportation facilities and pipeline would remain the same as described under Alternative 2.

Moderate impacts could occur from the project as planned at the mine site. Impacts from the proposed transportation facilities and pipeline would be minor to moderate. Standard design features are expected to reduce impacts at all three components to the levels defined.

Although Alternative 5A involves less habitat loss or alteration and smaller open water areas at the mine site than Alternative 2, which would slightly reduce the impact level, overall the direct and indirect impact level would remain moderate. These effects determinations take into account applicable impact reducing design features and BMPs, as discussed in Alternative 2. If the mitigation measures discussed under Alternative 2 were to be implemented, the impacts would be similar to Alternative 2, and would remain moderate.

3.12.5.2.7 ALTERNATIVE 6A – MODIFIED NATURAL GAS PIPELINE ALIGNMENT: DALZELL GORGE ROUTE

Under Alternative 6A the proposed pipeline route would be to the west of the proposed action between MP 106.5 and MP 152.7, and would traverse Dalzell Gorge. The other two project components (the mine site and transportation facilities) would remain the same as described under Alternative 2 and could cause the same (moderate) level of impact to birds. The only project component that would differ from Alternative 2 is the proposed pipeline.

Pipeline – Construction; Operations and Maintenance; and Closure, Reclamation, and Monitoring

Under Alternative 6A, more coniferous forest, deciduous/mixed forest, and land cover vegetation would be impacted; and the amount of shrub and herbaceous vegetation would be less than under Alternative 2. The change in habitat types affected may mean that different bird species may be affected. Overall, Alternative 6A would impact 16.31 fewer acres of vegetation than Alternative 2. The estimated number of breeding bird pairs potentially affected by each type of habitat loss or alteration is shown in Table 3.12-43 below. Shaded cells indicate Species of Concern. The effects of nest site loss are described in Section 3.12.5.2.2 under the heading Nest Site Loss or Disturbance.

Table 3.12-43: Estimated Number of Breeding Bird Pairs Potentially Affected by Habitat Loss or Alteration at the Pipeline under Alternative 6A

Habitat	Species	Estimated Density using EDR (birds/acre)	Habitat Lost or Altered (acres)	Estimated Number of Bird Pairs Affected
Forested-Deciduous/ Mixed	Fox sparrow	0.24	2,255.73	541
	Redpoll sp.	0.12	2,255.73	271
	Swainson's thrush	0.53	2,255.73	1,196
	White-crowned sparrow	0.00	2,255.73	0
	Ruby-crowned kinglet	0.24	2,255.73	541
	American robin	0.06	2,255.73	135
	Gray-cheeked thrush	0.03	2,255.73	68
	Yellow-rumped warbler	0.30	2,255.73	677
	Dark-eyed junco	0.30	2,255.73	677
	Varied thrush	0.06	2,255.73	135
	Gray jay	0.18	2,255.73	406
	Olive-sided flycatcher	0.18	2,255.73	406
	Alder flycatcher	0.35	2,255.73	790
	White-winged crossbill	0.00	2,255.73	0
	Orange-crowned warbler	0.00	2,255.73	0
	Blackpoll warbler	0.24	2,255.73	541
Needleleaf Forest	Fox sparrow	0.00	2,138.89	0
	Redpoll sp.	0.03	2,138.89	64
	Swainson's thrush	0.18	2,138.89	385
	White-crowned sparrow	0.05	2,138.89	64
	Ruby-crowned kinglet	0.21	2,138.89	449
	American robin	0.03	2,138.89	64
	Gray-cheeked thrush	0.15	2,138.89	321
	Yellow-rumped warbler	0.30	2,138.89	449
	Dark-eyed junco	0.17	2,138.89	364
	Varied thrush	0.13	2,138.89	278
	Gray jay	0.15	2,138.89	321
	Olive-sided flycatcher	0.00	2,138.89	0
	Alder flycatcher	0.00	2,138.89	0
	White-winged crossbill	0.03	2,138.89	64
	Orange-crowned warbler	0.00	2,138.89	0
	Blackpoll warbler	0.00	2,138.89	0
Shrub	Fox sparrow	0.00	3,233.56	0
	Redpoll sp.	0.18	3,233.56	582
	Swainson's thrush	0.08	3,233.56	259
	White-crowned sparrow	0.40	3,233.56	1,293
	Ruby-crowned kinglet	0.00	3,233.56	0
	American robin	0.03	3,233.56	97
	Gray-cheeked thrush	0.09	3,233.56	291
	Yellow-rumped warbler	0.00	3,233.56	0
	Dark-eyed junco	0.32	3,233.56	1,035

Table 3.12-43: Estimated Number of Breeding Bird Pairs Potentially Affected by Habitat Loss or Alteration at the Pipeline under Alternative 6A

Habitat	Species	Estimated Density using EDR (birds/acre)	Habitat Lost or Altered (acres)	Estimated Number of Bird Pairs Affected
	Varied thrush	0.00	3,233.56	0
	Gray jay	0.00	3,233.56	0
	Olive-sided flycatcher	0.00	3,233.56	0
	Alder flycatcher	0.00	3,233.56	0
	White-winged crossbill	0.00	3,233.56	0
	Orange-crowned warbler	0.16	3,233.56	517
	Blackpoll warbler	0.00	3,233.56	0
Total:				13,517

Source: Calculations based on data in ARCADIS 2011b.

Summary Conclusion – Alternative 6A

The overall effect of Alternative 6A on birds would be the same as described under Alternative 2, which is moderate. Although Alternative 6A involves slightly less habitat loss or alteration, which would slightly reduce the impact level, overall the direct and indirect impact level would remain moderate. Impacts associated with climate change would also be the same as those discussed for Alternative 2. These effects determinations take into account applicable impact reducing design features and BMPs, as discussed in Alternative 2. If the mitigation measures discussed under Alternative 2 were to be implemented, the impacts would be similar to Alternative 2, and would remain moderate.

3.12.5.2.8 IMPACT COMPARISON – ALL ALTERNATIVES

Although there are differences among alternatives in the project components that would affect birds, e.g. longer or shorter port road and pipeline, different operations at the mine site, and more or less barge trips, the summary impact levels are the same for all the alternatives because while the effects of one component may be reduced, impacts from the other components remain. For example, reducing the number of barge trips would reduce disturbance impacts, impacts from the mine site and proposed pipeline would remain; therefore, the overall impact of the alternative is unchanged. Because there are so many impact-causing components to the project, at least one of them would cause moderate impacts under each of the action alternatives. That does not, however, mean that the alternatives would affect birds equally. A comparison of the impacts by alternative is presented in Table 3.12-44.

Table 3.12-44: Comparison of Impacts by Alternative*, Birds

Impact- causing Project Component	Alt. 2 – Proposed Action	Alt. 3A – LNG-Powered Haul Trucks	Alt. 3B – Diesel Pipeline	Alt. 4 – BTC Port	Alt. 5A – Dry Stack Tailings	Alt. 6A – Dalzell Gorge Route
Mine Site						
Habitat loss or alteration	8,955 acres	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	8,866.8 acres	Same as Alt. 2
	10,010 pairs of breeding birds displaced from mine site and transportation facilities	10,010 pairs of breeding birds displaced from mine site and transportation facilities	10,010 pairs of breeding birds displaced from mine site and transportation facilities footprints	10,852 pairs of breeding birds displaced from mine site and transportation facilities footprints	9,848 pairs of breeding birds displaced from mine site and transportation facilities footprints	10,010 pairs of breeding birds displaced from mine site and transportation facilities footprints
Environmental contamination from tailings pond, CWD Ponds, and pit lake	Low potential for impact due to limited exposure	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Blasting/noise	Potential for local moderate impacts	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Risk of injury or mortality from collisions	Potential for moderate impacts	Fewer fuel trucks lower potential for impacts.	Fewer fuel trucks lower potential for impacts.	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Predators attracted to organic waste	BMPs would reduce impacts to minor	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Transportation Facilities						
Habitat loss or alteration	Angyaruaq (Jungjuk) Port site 30-mile road 872.90 acres	Same as Alt. 2	Angyaruaq (Jungjuk) and Tyonek Port sites 30-mile road, 872.90 acres	Birch Tree Crossing port site 76-mile road 1,791.30 acres	Same as Alt. 2	Same as Alt. 2

Table 3.12-44: Comparison of Impacts by Alternative*, Birds

Impact- causing Project Component	Alt. 2 – Proposed Action	Alt. 3A – LNG-Powered Haul Trucks	Alt. 3B – Diesel Pipeline	Alt. 4 – BTC Port	Alt. 5A – Dry Stack Tailings	Alt. 6A – Dalzell Gorge Route
	10,010 pairs of breeding birds displaced from mine site and transportation facilities footprints	10,010 pairs of breeding birds displaced from mine site and transportation facilities footprints	10,010 pairs of breeding birds displaced from mine site and transportation facilities footprints	10,852 pairs of breeding birds displaced from mine site and transportation facilities footprints	9,848 pairs of breeding birds displaced from mine site and transportation facilities footprints	10,010 pairs of breeding birds displaced from mine site and transportation facilities footprints
Increased barge traffic	122 river trips/year 26 ocean trips/ year from Dutch Harbor to Bethel	83 river trips/year 17 ocean trips/year from Dutch Harbor to Bethel	64 river trips/year 12 ocean trips/year from Marine Terminals in Pacific Northwest or from Tesoro Refinery in Nikiski to Tyonek	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
Pipeline						
Habitat loss or alteration	315-mile long natural gas 5,964 acres	Same as Alt. 2	334-mile long diesel 6,215 acres	Same as Alt. 2	Same as Alt. 2	314-mile long natural gas 5,728 acres
	13,551 pairs of breeding birds displaced	Same as Alt. 2	13,746 pairs of breeding birds displaced	Same as Alt. 2	Same as Alt. 2	13,517 pairs of breeding birds displaced
Blasting/noise	Potential for local moderate impacts	Same as Alt. 2	Same as Alt. 2.	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2

Notes:

* The No Action Alternative would have no impacts on birds.

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